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modern plastics

MARCH 1941

VOLUME 18 NUMBER 7

APRIL

Models made of plastics, both pre-production types and demonstration models, are becoming increasingly important in the designing of new products. The items shown above represent the pre-production model (at the left) machined out of cast-phenolic, and the finished molded article (at the right). Transparent demonstration models have been very important in industrial and experimental work. Next month we will present a survey on all phases of model making with profuse illustrations of present accomplishments and suggestions for new fields.

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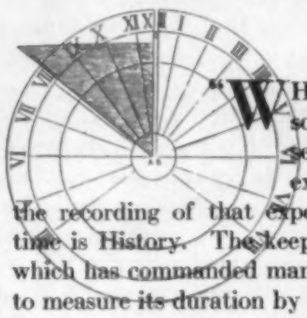
MODERN PLASTICS
WILLIAM T. CRUSE, Editor

MARCH 1941 VOLUME 18 NUMBER 7

R v.18 pt.2 Mar.-Aug. 1941

Plastics Mark Time

by ALFRED EGERTER*



"WHATEVER else life may be," some philosopher once observed, "it is a flow through experience and time." And the recording of that experience upon the pattern of time is History. The keeping of time is an operation which has commanded man's attention since he learned to measure its duration by the rhythm of the seasons, the movement of the tides and the regular occurrence of night and day.

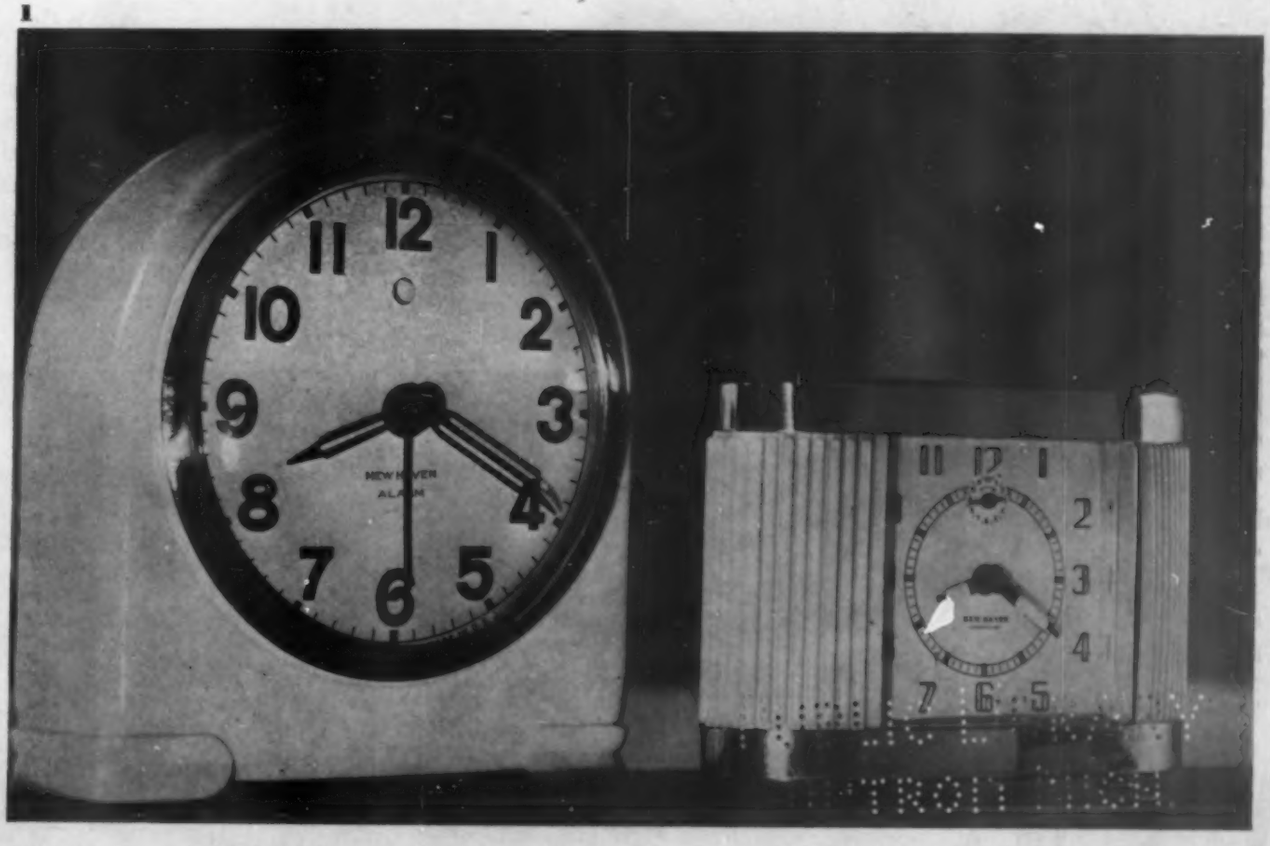
* Plaskon Co.

The machine we know today as a clock is ratner a recent addition to civilized man's instruments of utility when considered in the light of all time, or of recorded time for that matter. To be sure there were time devices in ancient Greece and Rome, and the Egyptians are credited with being the first to use a sundial for measuring the passage of time when the sun shone.

Then the hour glass and the water clock or clepsydra were developed. But it was comparatively recently that a satisfactory mechanical time piece was evolved, and, indeed, the earlier ones in this category required an

I—The vigorous looking alarm clock at the left is a sturdy model, simply designed. The small traveling clock at the right has a curtain arrangement that may be stretched over the back and front for protection. Both have molded urea housings

I



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astronomer to operate them and a mathematician to interpolate the readings. Almost a century passed from the discovery of the pendulum principle by Galileo to its application to clock making, and it was not until about the middle of the last century that sufficient improvements had been made to warrant production of enough mechanical clocks for any but the very rich.

With the advent of electric light and power a most revolutionary advance in time keeping was made when Henry Warren conceived the idea of correlating the impulses of alternating current to a time-keeping device—of substituting the rhythm of these vibrations for the swing of a pendulum or the turn of a balance wheel. This development in itself is of the utmost significance, since it is not too much to say that the entire utilities industry was conditioned by it and the use of alternating current thereby universalized.

What is particularly pertinent from the standpoint of plastics is the fact that the developers of this newest method of time keeping should, as they were reaching industrial maturity, seek the most modern and effective material in which to encase their product. Molded and cast plastic cases answered the mass production requirements of this revised industry. Plastics fulfilled the requirements for permanence of finish and color where needed for ease and uniformity of production. These requirements were: that, in practically a single operation, a completed clock case with the desired external design should be faithfully reproduced repeatedly. At the same time the housing had to incorporate functional intricacies essential to its integral assembly with the time-keeping mechanism.

The first plastic clock case was introduced in 1928, and despite the depressing times that almost immediately followed for all industry, the application of plastics to this use showed a hardy growth and these new materials seemed to inject new vitality into this industry. As the tempo of modern living was accelerated, the needs and duties of clocks were vastly augmented and instead of there being one dignified family clock on the mantle, each room in the house deserved and got its own time piece, now suitably encased for its particular

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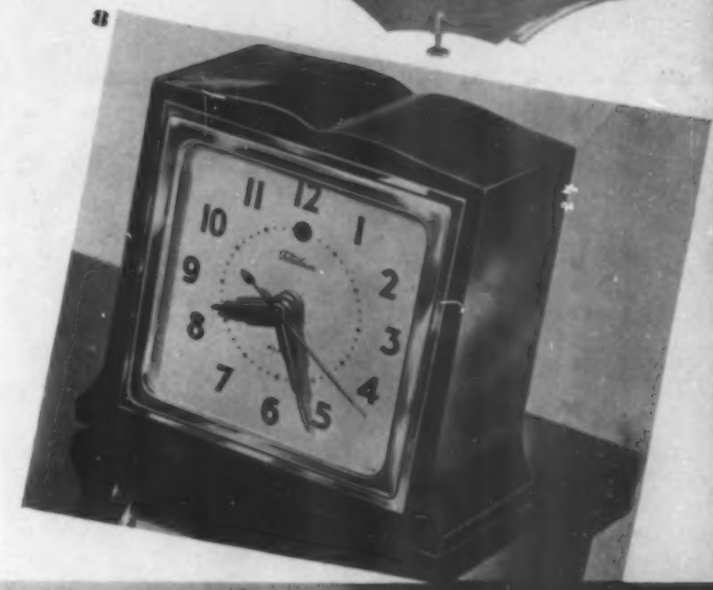
environs—kitchen, bathroom, bedroom or library. Here again is testimony to the ruggedness of our American initiative, for as the technique of producing quality clocks on a quantity basis was rendered more feasible, largely through the use of plastics, the consumer benefited through resultant price reductions and consequent ability to expand his purchases. Unlike price reductions that have been effected in certain instances by the sacrifice of the product's quality, the use of plastics in this industry again proves the fact that these new materials, far from being a mere substitute, represent a definite advance and improvement over the materials which they replace. In many cases plastics have made possible remarkable economies along with engineering and technical improvements.

Molded thermosetting (urea- and phenol-formaldehyde) materials have been most extensively employed in manufacturing plastic clock cases. Cast phenolics have also found wide application in the industry, and while they haven't been used in the same proportions as the molded types, they nevertheless account for supplying a substantial percentage of plastic cases. With the development of injection molding, thermoplastic materials have found some application as cases in the clock-making industry. Thus far, only cellulosic types have been employed.

Like all delicate mechanisms, the movement of a clock operates most efficiently when the temperature

2—Designed for the boudoir this dainty model has an ivory urea case. **3**—A halo of cellulose nitrate bubbles surrounds this clock which is set in glass. **4**—Encased in lustrous green cellulose acetate, this four-leaf clover model assures luck in the kitchen. **5**—A handsome, marbleized clock boasts a cast phenolic case. **6**—At home or on the road, ivory urea housings by Westclox remain both beautiful and practical. **7**—Two separate moldings of cellulose acetate and phenolic permit a two-tone color effect. Designed by Peter Muller-Munk, the case is enhanced by a gold finished metal band. Numeral drums of urea are easy-to-read and turn silently. **8**—Mottled brown cast phenolic gives a rich and enduring lustre to this housing. **9**—Practical standard kitchen equipment, these clocks available in several colors, are legible at any angle

9



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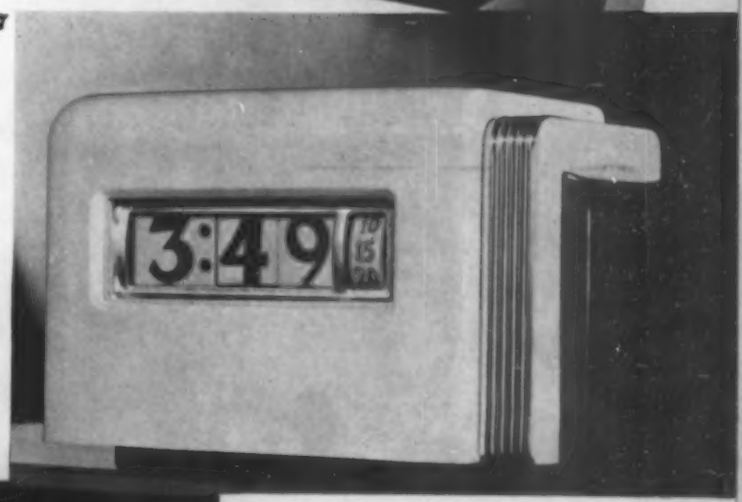

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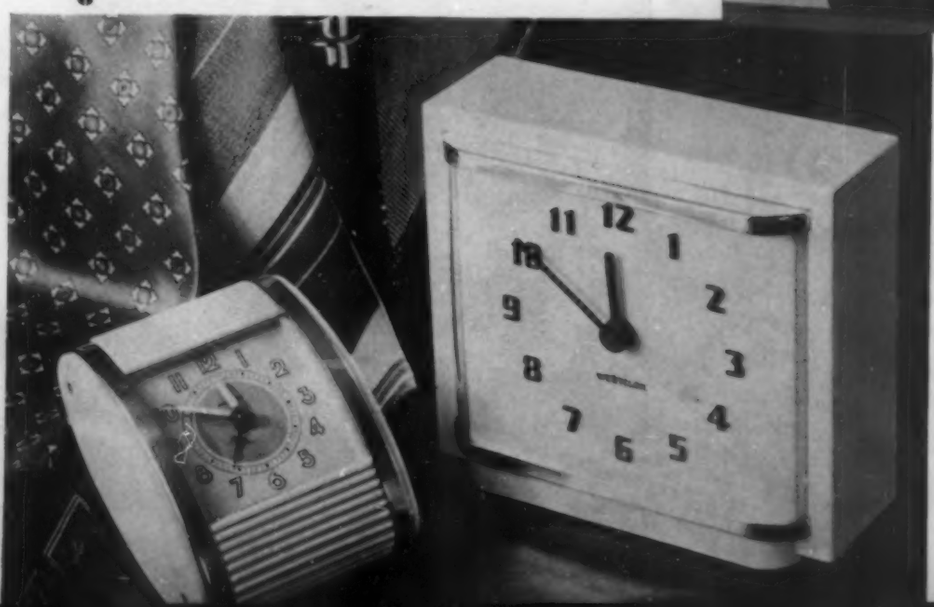

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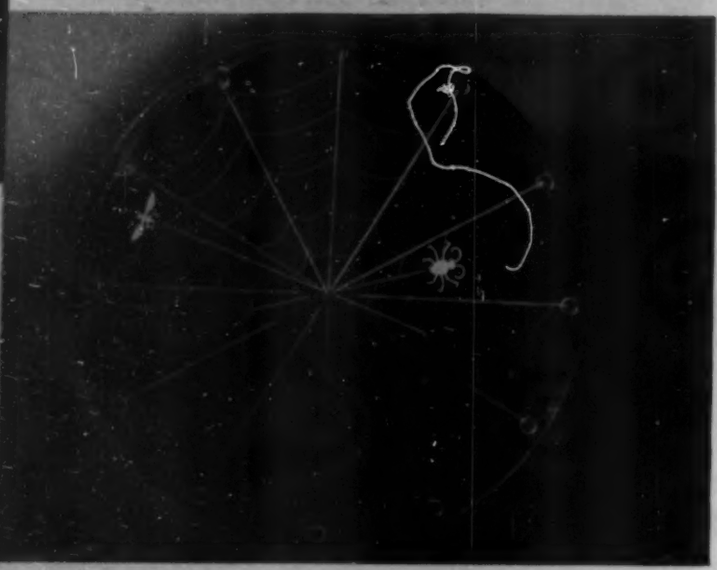

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in which it functions remains relatively constant. Since plastics do not conduct heat or cold to nearly the same extent as some of the materials they replaced, the plastic case provides effective insulation against sharp fluctuations in temperature, and their use prevents the direct transmission of external heat or cold to the mechanism itself.

Further, the exceptional dielectric character of the plastic case is also of great importance to the clock manufacturer as well as the user. Because the danger of short circuits caused by contact with the material itself is removed, the wiring arrangements in electric clocks are greatly simplified. This eliminates many extra operations in the assembling process as well as additional insulating at points of contact. The wire emerges neatly from the housing, and the user is protected against blown fuses and other mishaps caused by accidental contact between a frayed wire and a metal case.

An additional advantage of the plastic clock case is to be found in the fact that these materials are devoid of resonant characteristics. The tick of a mechanical clock and the hum of the motor in an electric time piece are greatly muffled by the use of a plastic housing. Further, while plastics have not been used to house a chime clock, or a modern counterpart of one, there is every reason why these materials should serve admirably for such purpose. (*Please turn to page 86*)

10—Rimmed in sparkling, molded acrylic plastic, one rose, the other pale blue, these clocks are shatterproof and lightweight. **11**—This delightful spider web clock is etched on a clear sheet of methyl methacrylate with small buttons of the same plastic used to indicate the numerals. Ebony laminate forms the face. **12**—A molded phenolic case encloses a time-at-a-glance model. **13**—Suitable for a premium item, this speedometer-type model has a molded phenolic case designed along strikingly simple lines by Peter Muller-Munk. **14**—A cast resin housing shown before and after it "gets the works"

14

1

PHOTOS, COURTESY BAKELITE CORP.

1—Precision built, airplane pulleys, fairlead bushings and pulleys and other parts machined from durable phenolic resin-impregnated laminated are replacing metal in modern airplanes. 2—Lightweight, hollow gunstock of high impact phenolic, molded by the transfer method, is meeting military needs for uniform, accurately assembled mass produced parts

Relieving the metal bottleneck

As war materials, plastics played an important part in World War I. They have shouldered arms and are now off to our defense program of World War II. They are being applied directly as parts in war machines and they are being relied upon to replace certain metals. In World War I, plastics were employed as insulating materials in internal combustion engines, they were used in motorized equipment as side curtains, they were an essential part of communication devices—these uses, to mention a few, included some of their important functions.

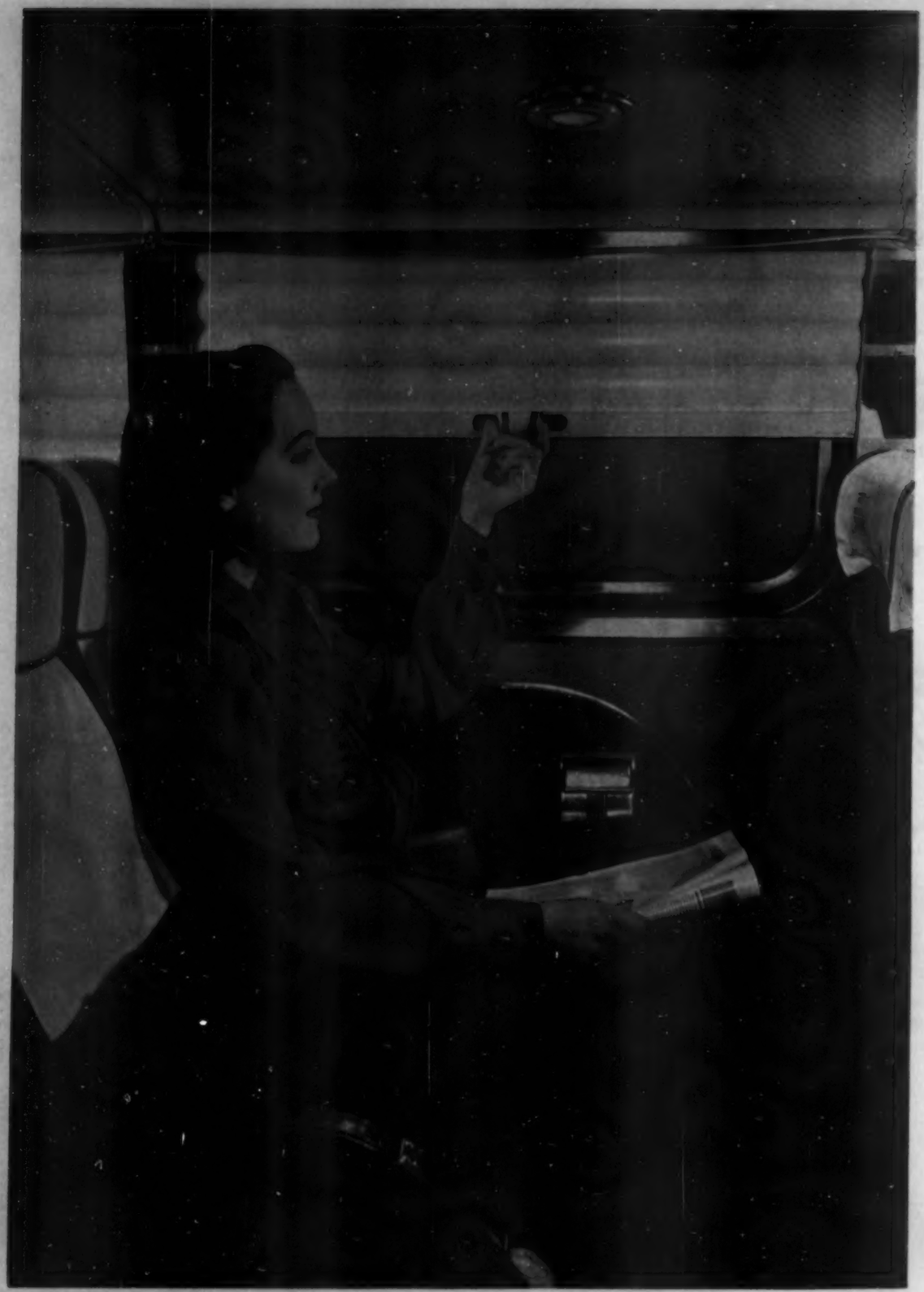
The implements of war were then, by comparison with those of today, relatively simple machines. Man's ingenuity has moved on. It has wrought many changes in his war tools. The modern war mechanization program has enlisted the cooperation of every science and has utilized all kinds of materials—the older essential raw products such as iron, steel, wood, rubber and copper, augmented by newly created substances. Sometimes developed to meet a specialized application, in other instances new materials have been created to relieve a critical or doubtful source of reliable supply. Perhaps the arrival of wide-spread third-dimensional warfare has given more impetus to material development than any other phase. Airplanes beyond any other type of equipment demand materials having a favorable weight-strength ratio.

Added emphasis to the importance of plastics as a means of easing the situation caused by shortages of defense metals is given in a recent statement issued by E. R. Stettinius, Jr., Director of Priorities for the Office of Production Management.

"The impact of the rapidly developing defense program on our economic system" Mr. Stettinius said, "now makes it imperative that certain vitally essential metals be conserved as much as possible for primary defense purposes. This is especially true in the case of aluminum, magnesium, and zinc.

"With defense industries (*Please turn to page 100*)

2



KOLOR PLATES AND PHOTOS, COURTESY TENNESSEE EASTMAN CORP.

Attractive window shades that will forever be free of the drab, grimy color bespeaking long use are now being molded of cellulose acetate butyrate for one of the country's best known line of buses. Made in a flesh tint color that casts a warm glow, the shades are lightweight, yet sufficiently tough to withstand constant handling through cross country trips. They are easily cleaned with soap and water, quiet in operation and lock in place

Cruiser coach shade

OVERLAND travel in this mechanized world is a far cry from the covered wagon of the hardy pioneers. Today's "soft" nomads prefer the comfort that modern design and modern materials create. Sleek, giant motor coaches, streamlined for speed and convenience, in competition with other forms of transportation, have been redecorated inside and out, for maximum appearance as well as utility. Plastics have ridden inside from some time in the form of knobs, lighting fixtures, laminated luggage racks,* etc., and now an all-plastic translucent molded shade makes its debut at the windows of a well-known line of coast-to-coast busses.

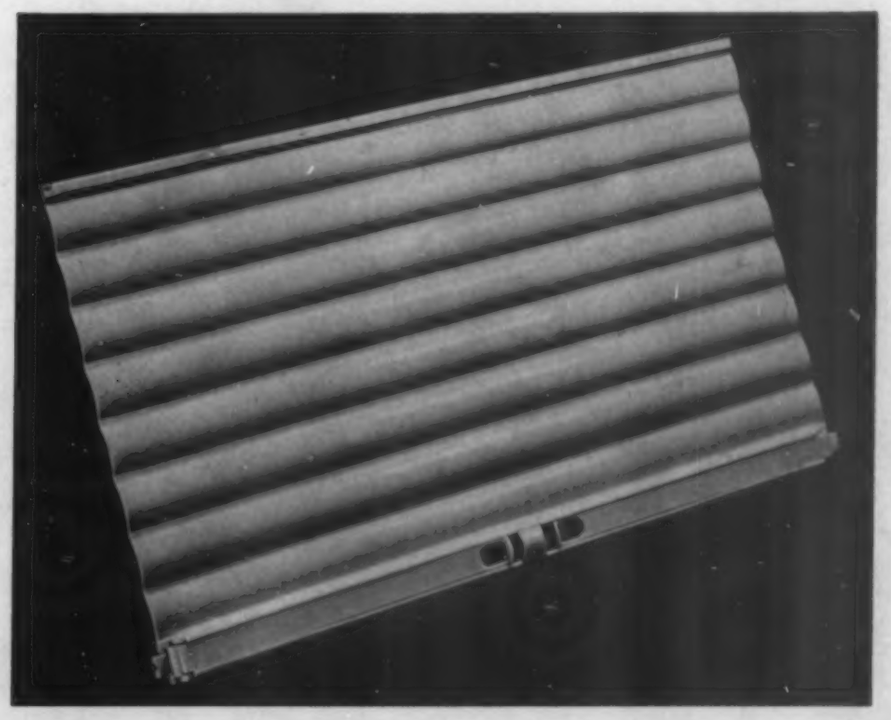
Made in three sizes, the shade is among the largest compression molded thermoplastic pieces that have been produced. Overall dimensions and weights of all three are as follows: $33^{1}/_{4}$ in. by $17^{3}/_{16}$ in. by .095 in. and 3.2 lbs. for the large size; $32^{15}/_{16}$ in. by $17^{3}/_{16}$ in. by .095 in. and 3 lbs. for the standard size; and the smallest measures $22^{1}/_{4}$ in. by $17^{3}/_{16}$ in. by .095 in. and weighs 2.2 lbs. The finished piece is in the form of a fluted sheet and operates in slides somewhat like the old-fashioned roll-top desk. When raised, the corrugated shade slides up into the upper portion of the coach roof and the sides lock firmly into place, so that the motion of the bus will not cause it to rattle.

In addition to the many engineering and technical problems involved in the production of these large moldings, some of the customers' exacting requirements presented further considerations. The material had to be translucent enough to admit a soft light, yet possess opaque qualities to a degree where it would eliminate glare. It had to be light in weight, stable, easily cleaned, strong and at the same time sufficiently attractive to appease the artistic specifications of the industrial designer. The engineers required dimensional accuracy for this part and demanded tolerances closer than the usual commercial limits.

One of the reasons for the selection of a plastic material for this shade was its resiliency. Both the cloth and metal shades which had been previously used for this part created many rattles in the bus. The elimination of these noises with the use of the plastic resulted not only from the flexibility of the material itself, but from the shape of the unit which adapted itself to the contour of the top of the bus, remaining firmly in position when adjusted. Cellulose acetate butyrate was selected to meet these conditions since changes in atmospheric, weather and climatic conditions would have little effect on its stability and ease of handling. The desired color harmony and soft light were provided by choosing a translucent, pink-beige tone, molded from $^{1}/_{8}$ granules.

The mold for the shade was constructed in such a manner that it could be utilized to produce the three different sizes of shades which were used in the bus. Because of the size of the part, a cycle of from 10 to 15 minutes was required to produce each shade. The retainer and the latch strips which (*Please turn to page 106*)

* Fybr-Tech, award winner 1940 Modern Plastics Competition, October 1940, page 111. (See photo opposite)



One of the largest thermoplastic pieces ever molded, this shade presented a number of problems for the molders. Three sizes of this shade are used in the buses and all are produced from the same mold. The retainer and latch strips are also molded of cellulose acetate butyrate plastic

Superwalls speed building

ACCOMPLISHING a Herculean task in the twinkling of an eye, a new type of jumbo-sized wall board now makes it possible to construct a room in a few hours. This material is resin-bonded Douglas Fir plywood available in panels as large as 8 by 20 feet.

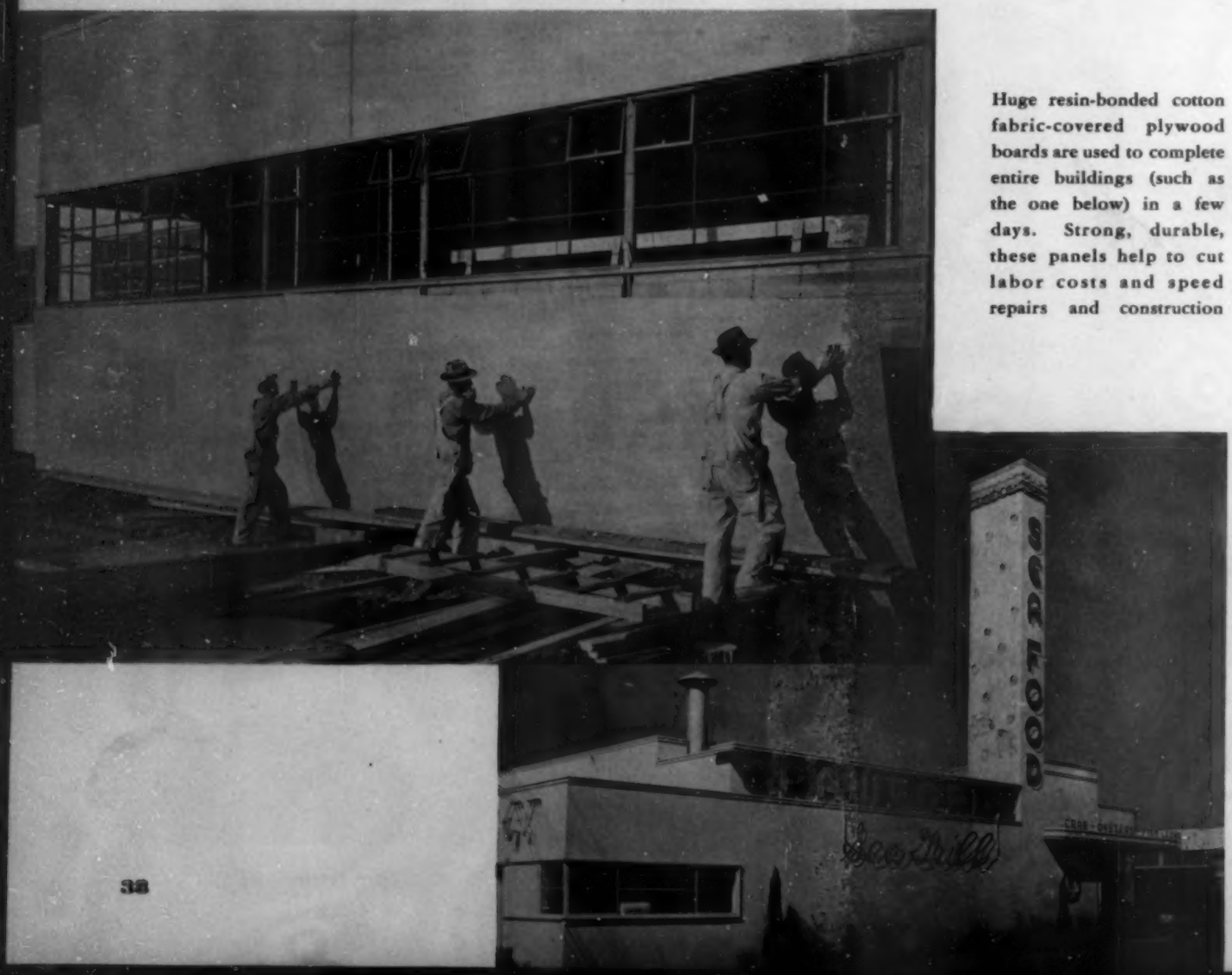
The panels are made up in these huge sizes with a $^{5}/_{16}$-in. thickness. Permanently welded together in a hot press, using zinc-chloride compounded with urea-formaldehyde as the bonding agent, the panels eliminate the necessity of using lath and plaster. Subsequent decoration of this material is claimed to be sure and simple. The surfaces that are to be decorated are sealed and "dressed" with a special quality woven fabric that has been impregnated with a moisture- and fire-resistant adhesive. This provides a sound, non-cracking, non-checking base for paint or wallpaper. The cotton fabric is affixed to the surface of the board by embedding in synthetic resin alkyd plastic.

These panels are said to be "stronger than steel by weight," and rigid since there are no joints. The boards are strong and lithe and can be bent to conform with structural needs, and they cut true. Weighing about 1 lb. per sq. ft., they are lightweight and easy to handle.

This resin-bonded material, according to reports, is strong, possesses good impact resistance, is fire-resistant, a low conductor of heat, has no wind permeability, absorbs little moisture, expands very little. In addition to the larger boards, fir plywood panels, 4 ft. by 8 ft., are available for making flush walls and ceilings.

To the layman these wall boards are significant in two ways: as a modern, "fast handling" material that can be used to cover cracked, unsightly walls and ceilings, and as a material to substitute for plaster and other such products that require time and "messy" labor to use. Windows and doors can be quickly cut out and nailed in place. The material goes right on over conventional studding—panels are nailed or glued directly to studs. Painting or papering can begin at once with no waiting for plaster to dry. Ideal for building new partitions, these boards are a "natural" for the extra room that is always "going to be created" in the attic or basement.

Credits: Jumbo Speedwall board by Speedwall Co. Bonded with Lauxite, and alkyd resin from I. F. Laucks, Incorporated.



Huge resin-bonded cotton fabric-covered plywood boards are used to complete entire buildings (such as the one below) in a few days. Strong, durable, these panels help to cut labor costs and speed repairs and construction

Molding resin-treated paper

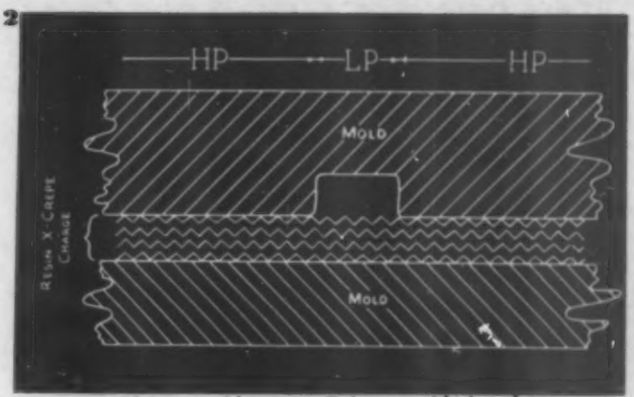
by W. A. MORRIS

1—Experimentally molded, Bicycle saddle seat (right) is of all-directional stretch resin-impregnated crepe paper. On the unfinished saddle (top) chalk cross-hatched lines demonstrate how the material flows in a full flash mold. Sectional view of complex molded part (left) shows how the material fills all contours. **2**—Diagram of mold in open position and closed (**3**) shows flow that takes place in a charge of the x-creped sheets. At closing, pressure is concentrated at HP which causes material to flow to LP until pressure is equalized as indicated by arrows in Fig. 3

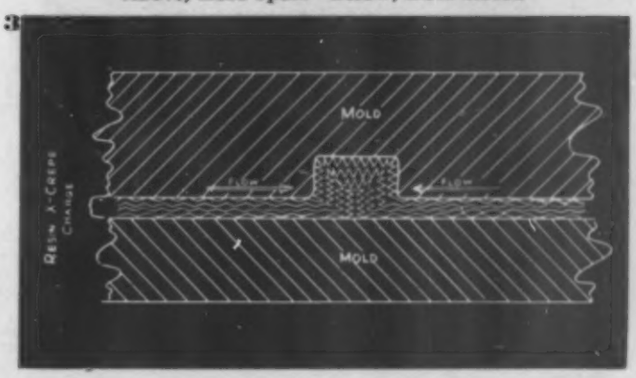
BRIDGING the gap between the molding powder branch and the laminating branch of this fast growing industry, a new resin-treated crepe paper having stretch in all directions has been developed which will permit the forming of molded objects with compound shapes, yet which will have the strength of continuous laminations.

This new material, because it supplies the essential property of flow within the mold that has been lacking in laminations heretofore, will probably make possible large plastic pieces with relatively thin wall sections even though the pieces have deep draws or formations. Such pieces as deep trays, sinks, automobile fenders, caskets, table tops with molded edges, may now become a reality. Because it is so difficult to flow molding powders in large areas with thin wall sections, such pieces have heretofore been practically impossible.

Plastics engineers have long recognized that molding powders, even the high impact powders, have great moldability but lack structural and impact strength, while laminated structures possess great strength but lack moldability. Consequently, numerous attempts have been made to combine the good characteristics of both. Shredded or chopped-up saturated canvas has moldability but its strength, (*Continued on page 92*)



Above, mold open. Below, mold closed



* The Paper Service Co.

Soft-face hammers

Did you know that hammers can have soft faces? They can, and they're not softies either! To meet the increasing demand for hammers of this type, one manufacturer has recently added 5 new models to its line. These new sizes are particularly useful where a hammer is needed that will not mar finely finished surfaces or delicate machine parts. The new shaped tips are especially adapted for forming and working light sheet metal. Fabricated of $1^1/_4$-in. cellulose composition rod stock, these hammers will not shatter or chip. They are available in an amber color, and in all cases the tips are renewable. The hammers have hickory handles designed with a comfortable grip and are securely wedged in the orange steel center body. Hammers are available with one regular face tip and one ball peen tip; with one straight peen tip and one cross peen tip; with two ball peen tips; with one square tip and one offset peen tip; with two regular face tips and with one regular face tip and one regular face tip with brass insert. Many of the hammers have the same size tip studs and tips and, therefore, are interchangeable for those hammers. The head weights range from $1^1/_2$ oz. to 2 pounds.

Credits: Cellulosic plastic from Celluloid Corp.; Bonney Forge & Tool Works.

PRODUCT DEVELOPMENT

Chewing gum display

In less than four years several hundred thousand molded plastic display cases have made their appearance on retail counters to enhance the presentation of American Chicle Co. products. The sales promotion value of the plastic "merchandisers" is indicated by the increasing number to be seen at the point where money changes hands. The first plastic display used, designed as a penny catcher to promote sales of 1¢ Chiclets, was similar to the model pictured at top right, but had only four compartments. With the addition of a fifth flavor, Charcoal, a new unit was created for 1¢ packages which also incorporated a display area for 5¢ cartons. Units are adapted to the shape of the packages, arranged in steps to achieve compact, inviting appearance. An added feature consists of molded-in compartment walls which keep the packages in perfect alignment. The sleek black phenolic has a permanent finish, will last indefinitely, and provides a setting which does not detract from the gay cartons. Overall dimensions of the small unit are $8^3/_4$ in. wide by $6^1/_2$ in. by 2 in. high. The larger display measures $8^3/_4$ in. wide by $9^{11}/_{16}$ in. by $4^1/_8$ in. high at the back.

Credits: Molded of Makalot, Bakelite and Durez by Northern Industrial Chemical Company. Molds by Special Tool and Machine Company. Lumarith windows on packages.

Racquet strings

Tennis in the rain? Not much fun, of course, but these nylon strung racquets won't mind it a bit. Made possible by a newly developed "giant" strand, nearly 1/16 in. in diameter, these strings are exceptionally durable and practically indifferent to water or atmospheric conditions to which other string materials are sensitive. While not indestructible, the strings cannot dry out and do not deteriorate in storage over protracted periods, resist breakage and retain their original properties in spite of rough usage. As the nylon is a solid piece unlike other racquet strings which are twisted of silk or gut, there are no tiny threads or strands to fray; thus waxing or shellac treatment is unnecessary. The size of the strand has the same proportion to a strand of hosiery nylon as a ship's hawser has to a piece of packaging cord—and will be produced for general sporting goods use. Sizes for tennis and squash, and in 35 ft. coils, will be made—.055 in. in diameter, corresponding to 15 gage, and .050 in., corresponding to 16 gage. A diameter of .032 in., corresponding to 20 gage will be available for badminton. Production costs, we are told, will permit a price lower than gut, but slightly higher than silk strings.

Credits: Nylon by E. I. du Pont de Nemours & Co., Inc. Distributed by sporting goods suppliers.

PRODUCT DEVELOPMENT

Automatic leash

Curb your pet or let him romp—just press the small thumb switch on the plastic case and you can reel in this 6-ft. leash to any desired length and it locks in position. Perfect for distracted strollers or window shoppers, the Leash-O-Matic has a chromium plated reel and a hardened steel spring which gives automatic control over the leash. The mechanism is housed in a strong, two-piece injection molded cellulose acetate case. Both parts, molded separately in single cavity molds, meet in close alignment and are fastened by four recessed head cross-slot screws. The case, smooth-surfaced, fits comfortably in the palm of the hand or it can be suspended from the wrist by the adjustable calf-skin strap, which is threaded through a slot at one end. The small rectangular control switch and oval knob at the leash clip are molded plastic also. Handsome shades of buff, blue or white mottle add to the attractive appearance of the case. Lightweight, compact, the case measures 3 1/4 in. by 2 1/2 in. at the center and is 1 in. deep. It is unaffected by temperature changes and pleasant to handle in warm or below zero weather.

Credits: Tenite, molded by Thomas Mason Co. for Maveo Sales Co. Molds by Newark Die Co. Phillips Recessed Head screws.

Illuminated platen

Clear, transparent methyl methacrylate combined with fluorescent lighting has resulted in a typewriter platen that not only speeds up stencil cutting, but improves the quality of the work. Possessing the resiliency of hard wood, plus excellent wear-resisting properties, the transparent platen acts as a window through which light from the fluorescent unit, located at the back of the typewriter, is "piped" into the carriage of the machine and through the stencil. Thus the stencil is actually illuminated from beneath as is each individual character through which the light shines. The quality of the cut is constantly under observation, assuring even, clear mimeographed copies and preventing difficult resetting in the typewriter after a complete stencil has been made. This plastic platen is invaluable for statistical work where accuracy and clear printing are essential. The 6-watt fluorescent unit attaches in a few seconds to the base of any typewriter and rises up behind and over the carriage, affording maximum illumination. The plastic platens are made in a variety of sizes to fit all standard carriages. Use of the plastic roll enables the operator to make twice the number and sharper carbon copies than heretofore.

Credit: Designed by Ronald Gordon. Manufactured by Lumirol Co. of Lucite. G-E fluorescent lamps.

PRODUCT DEVELOPMENT

Flashlight display

A horseshoe of flashlight and battery cells, compactly arranged in plain sight and within easy reach of the customer, the "Sales Magnet" molded phenolic counter display unit is said to have upped sales in 2500 retail stores from 100 to 500 percent. Rather than using many counter cards, each of which would hold a single style of flashlight, the company found that a tray assembly with the different sizes of flashlight cells on display, surmounted by a variety of many flashlight models, set in order of size, actually and automatically increased sales both for the lights as well as the cells. This unit was produced in three different styles, the plastic model having been designed for the best line of lights and the better stores. Designed as a sloping, semi-circular unit, this display measures 12 in. across, and 14 in. deep. It will accommodate 11 flashlights and a workable stock of three different types of cells. A battery tester is provided at the side. The wells into which the flashlights are dropped range in diameter from $^3/_4$ in. to $1^1/_2$ inches. Some of these receptacles are deeper than others in order to hold the larger models. Ribbed sections underneath provide strength.

Credits: Insurok phenolic molded by The Richardson Co. for Ray-O-Vac Company.

Card duplicator

Saving time and costly preparation of post-card size direct mail pieces, the Pac Duplicard produces 1000 cards per hour. Housed in a handsome, one-piece molded phenolic case, the device is styled with modern flowing lines and weighs but 1 lb., 11 oz. complete. A fluted red handle knob and wiped-in red strip down the center contrast with the sleek ebony surface and the solid plastic case provides the sturdy construction and permanent finish so vital to the life of hard-working office appliances. Gravity feed—an improvement over horizontal feed duplicators—allows easy insertion of cards, and insures evenness in printing as well as uniformly accurate registration. The Duplicard's exclusive full-floating printing assembly equalizes the printing pressure and insures perfect copy in large as well as small runs. Supplies—stencils and cards—are inexpensive and the stylus is furnished with each machine. Stencils require but minutes of typewriting or cutting with the stylus pen. Operation is simple—just insertion of the card and a flip of the handle to turn the cylinder over the rubber impression roller. Economical, speedy, the machine is ideal for small offices, schools, clubs, and is good-looking enough for home use.

Credits: Textolite, molded by Plastics Dept., General Electric Co. for Pac Mfg. Corp.; designer: William B. Petzold.

PRODUCT DEVELOPMENT

Giant sterilizer

In keeping with the air of sanitary elegance prevalent in the modern hairdressing shop, the makers of Zeno machineless permanent waving equipment have designed a tall, lightweight, roomy, plastic-housed wet sterilizer to sell as a special premium along with its products. Measuring $10^1/_2$ in. in overall height by $4^1/_2$ in. in diameter, the sterilizer has a cleverly designed metal lift-out tray which is attached to the cover by a rod terminating in a decorative ball on top. Contents pop up ready for use when the top is raised. The sleek black cylinder, molded of durable, chemical-resistant phenolic fits snugly inside the hollow white urea base reinforced with 4 inner ribs. A decorative three-deck molded cover matches the base. All metal parts are chromium plated and the plastic sections are non-corrosive, and immune to the effects of germicidal or cleaning solutions, hair tonics, oils, alkalies or acids. Sufficiently deep to hold full size combs, clippers, scissors and other tonsorial equipment, the case is neat and permanent in finish. The smart black and white offset by the red cross label pasted on in front, will blend with any color scheme—in either dainty beauty or starkly severe barber shop.

Credits: Durez and Bakelite urea; molded and distributed by Raymond Laboratories, Incorporated.

PHOTO, COURTESY TENNESSEE EASTMAN CORP.

Compact and designed along simple lines, this light personal radio is encased in cellulose acetate butyrate. Both box and cover are injection molded in one complete cycle. End-loop-aerial cover and knobs are of the same material

One-shot radio housing

by DANIEL SZANTAY*

ON Sunday afternoon, on a holiday picnic or vacation trip, or even a casual stroll, the compact personal radio has now become standard equipment along with cameras, field glasses and wax-paper wrapped lunches. Because of the sturdiness, light weight, dielectric strength and smart finish required for these cases, plastics have swept through the field and are found in almost every new model on the market. The speed of production and economy demanded by the radio manufacturers have pointed increasingly to injection molding—most frequently where several parts of the same cabinet are to be produced simultaneously.

In planning the attractive, new General Motors portable, stringent standards were established. The completed job had to have a permanent, durable, jet black finish which would not scratch easily, and stand rough handling. The material had to have good acoustical properties, provide insulation and yet add a minimum of poundage. Cellulose acetate butyrate provided the tough, moisture-resistant surface demanded.

Designed to present an initial appearance of utter simplicity, the cabinet would seem to suggest the necessity for only ordinary toolroom operations and a comparatively easy molding process. However, it was precisely this factor of simplicity of design which caused the greatest production problems.

The complete job consisted of five thermoplastic parts: the box; the cover; the end-loop-aerial cover; and two knobs. The knobs and antenna cover were relatively simple as they were produced by conventional molding methods. The box and cover, however, were met by the engineers with furrowed foreheads and reams of drafting paper. Careful preparation and planning of specifications in advance eliminated many machining operations such as drilling or slotting. Mechanical side action was therefore required to core such openings. Altogether, (*Please turn to page 90*)

* Sinko Tool & Mfg. Co.

Complete plastic dentures

by E. BYRON KELLY, D.D.S.*

PLASTIC materials have been used for denture bases since John W. Hyatt, in the early sixties, developed the camphor-plasticized cellulose nitrate plastics. It is only lately, however, that the researcher has found other applications in dentistry for the use of the more recently commercialized plastics. Reviewing briefly the history of materials used in denture construction from the wood and ivory carved mouth appliances for which the aborigines of many continents were responsible and have been given a reasonable amount of credit, down through the plastic era covering the last century, there has been a long, continuous trail of organic plastics both thermoplastic and thermosetting used in denture bases.

The first radical departure from the old vulcanized rubber dentures occurred just previous to the Civil War when the cellulose compounds were introduced to the profession. This change in materials was not due entirely to the superiority of the plastic but was also the result of an attempt to collect a fee on a process patent on vulcanite which was demanded of every dentist who constructed dentures of this character.

Artificial dentures with a cellulose nitrate base possessed many outstanding features: the material was tough, reasonably hard, easily molded and when properly prepared gave astonishing adaptation to the mouth tissues. This *fit* may be attributed to the stimulating action of the camphor in the material which caused a slight continuous dilation of the gums and soft tissue of the mouth. Cellulose nitrate, however, with its relatively high water absorption properties failed to meet the requirements for an ideal base.

One of the most favored of plastic materials for denture bases was derived from the phenolic group. This thermosetting material, because of its hard, smooth finish, and low moisture absorption has been widely used by the dental profession. In time the material deteriorated in the mouth, brittleness and

* Prosthodontist, Chicago, Illinois.

1—In the production of all plastic dentures, with teeth and base of acrylic material, the first step is to take an impression of mouth and teeth in an elastic material. Then a master cast is made to show missing teeth. **2**—Stone cast made from the impression shows that the front teeth are separated and one tooth is missing. Spaces are then closed with soluble stone and carved to approximate natural teeth. **3**—An elastic rubber mold is obtained from the master cast. **4**—Duplicate cast is made from this with space between central incisors closed. The case is waxed, foiled and invested in an iron flask

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loss of color followed and to add to the dentists' and manufacturers' troubles, repairs were difficult to make and unsatisfactory.

Vinyl resins for denture bases had a rapid rise in popularity about eight years ago but in a short time after complaints of shrinkage, discoloration in the mouth, and difficulty in processing this type of plastic, it soon disappeared from the dental market.

With the introduction of acrylic resins to the profession, in 1937 and 1938, for denture bases, there has been a remarkable increase in the use and the sale of the material. At the present time acrylic resins, by virtue of their particularly suitable properties, are apparently leading other plastic base materials.

Acrylate products have many outstanding qualifications which give them a favorable position both with the dentist and the laboratory technician. The material is comparatively easy to process, repairs are not difficult. Water absorption and physical changes following the molding processing are insignificant. Water absorption varies from .4 to .5 percent after 24-hour immersion depending upon the material and the technic used. This does not appear to be a serious deleterious factor as the material retains its color and shows only minor changes after four years' usage.

Development of plastic teeth

While many changes have occurred in the denture base material which have been used during the last century, porcelain teeth during this long period have always been used to complete the finished denture. With plastics replacing in some instances glass and porcelain in industrial fields, dental research soon followed to determine if these organic materials could replace old style porcelain teeth and crowns.

Early in 1938, teeth were made by using a colored acrylic polymer base, reduced to the molding stage by heat. The material was formed in plaster tooth form molds. Shortly thereafter, (*Please turn to page 94*)

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5—After teeth are carved, molds are made into which the plastic is packed and cured. **6**—Soft plastic material is packed in flasks to form teeth. **7**—Crust hardened form removed and cut to allow proper relation of pink material to be added. **8**—Completed, all-plastic denture is ready for insertion

Plastics defense conference

AT a joint conference attended by representatives of the various sections of the plastics industry and by delegates from the United States governmental departments including the Army, the Navy, the Department of Agriculture, the Department of Commerce and Office of Production Management, action was taken to establish a committee to collaborate with the various branches of the government on their plastics problems and projects. Held at the Mayflower Hotel, Washington, D. C., February 21, 1941, the conference, to meet with the government representatives, was called in response to numerous requests and suggestions from companies and individuals in the plastics industry. The Board of Directors of the Society of the Plastics Industry provided the facilities of its organization staff and office to handle the mechanical routine of the meeting such as sending invitations, announcements, notices and making hotel arrangements, since at the suggestion of the government, the Washington conference was open to the industry at large. The complete report of the meeting follows.

The morning session was devoted to reading of technical papers and to several topical discussions. Henry Kasch, president of SPI welcomed the group and George Sicard, executive secretary of SPI discussed the urgent necessity of adopting a program. He pointed out the existing demand for a clearing house for all types of plastics information.

C. W. Blount, Bakelite Corp., stressed the urgency of cooperation, citing the dire grim results conceivable when it is lacking. He forcibly illustrated that neither plastics nor any other part on ship or airplane should fail when the crucial test of combat arrives. He pointed out that while specifications as drafted, requirements of production as established, may at times seem onerous, they exist for concrete reasons. These cannot, of course, be divulged on account of military secrecy. If through cooperating, through working to the set standards, and by assisting in developments, misunderstandings can be eliminated or improvements can be accomplished, it should be welcomed.

Major Fletcher* of Chemical Warfare Service read a prepared paper on plastic gas mask parts including lenses, reviewing their application and pointing out the advantages and shortcomings. He demonstrated with exhibits of actual gas masks applications of various kinds of plastics on both army and civilian types. He emphasized the importance of the contributions which the raw material suppliers and molders had made to the Chemical Warfare Service plastics program.

Commander E. C. Forsyth of the Bureau of Ships, U. S. N., was introduced, following which J. B. Lunsford, of the same service discussed very briefly the Bureau's general approach toward specifications. As it is objective, he said, they must have facts. They can proceed neither safely nor securely on assumption—in considering any material their approach is to take into account the known characteristics; then, through exhaustive testing and retesting, finally, arrive at conclusions. Of necessity, they must and do maintain an open mind and attitude. This method has in the main proved reliable and satisfactory.

Roy Berg* Tech-Art Plastics Co., addressed the conference on *The Employment of Impact Phenolic Molding Materials for Army and Navy Use.* He stated: "Among the ever-growing uses to which phenolic plastics are being put by both the military and the naval forces of the United States are many parts in which shock resistance or impact strength plays an important part as contrasted to those parts for which the cellulose-filled general purpose molding materials are entirely adequate. To meet this need there are available several different compounds, varying in inherent impact strength, which incorporate long-fibered fillers ranging from finely divided cotton fibers to shredded fabrics.

"These shock-resistant molding materials may be designated as types 1, 2, and 3 in the order of their increasing impact strength.

"Type 1 materials are readily molded and produce parts of high surface luster. They are used in the molding of plastic parts where an impact strength of 1.7 times that of general purpose materials is advantageous. Parts molded of these materials are more resistant to boiling water than those of general purpose compounds. They are capable of being preformed on automatic tabletting machines with special feeding devices.

"Type 2 materials possess an impact strength of approximately 5 times the general purpose type. They are not regularly controlled for electrical properties and are unsuitable for preforming on automatic tabletting machines.

"Type 3 materials have the highest impact strength of the phenolic compounds and should be molded in truly positive molds. Their impact strength is approximately 15 times that of the general purpose materials. They are unsuitable for preforming except by hand.

"The specification of shock-resistant molding materials by both Army and Navy for a great diversity of parts which in everyday commercial practice could be satisfactorily molded of general purpose compounds is necessitated by the consideration of great stresses suddenly applied by the detonation of heavy guns and high explosive charges in the vicinity (*Please turn to page 100*)

* The reports of Major Fletcher and Mr. Berg will be presented in their entirety in forthcoming issues.

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1 and **2**—A new trend in the decoration of church interiors is marked by the introduction of acrylic plastic gates carved in religious symbols. Fastened with long iron hinges, heavy and beautifully carved, the gates add a touch of elegant simplicity to the ecclesiastical décor. Henry McGill, A.I.A., is the architect. **3**—A setting in the studio of William John MacMullin shows a cocktail table and lamp and occasional table of clear methyl methacrylate grouped around a white and green polished steer-hide sofa. The combination of materials is pleasant. **4**—A stunning contrast with rich mahogany are the sparkling pieces of plastic trim adorning the sofa, chair, revolving book table and lamp table of this Regency group. The clear acrylic is carved into posts, rosettes, ferrules and odd bits of trim. **5** and **6**—The formal Early American dining room in Helena Rubenstein's Greenwich home features transparent plastic furniture specially designed. Table measures 68 in. across. Sailor knots tie the legs to the bottom ring and all parts are fitted without screws. Chairs are constructed in a similar manner with an engraved rose in the center back as the only ornament. The mirror-backed cabinet against the wall is also plastic. Concealed lighting illuminates the head and foot pieces of the bed. Bedside table with its cherub-like base has a plastic top

INVADING INTERIORS

IT was not so long ago that plastics were struggling to break into the field of interior design. We say "struggling" and mean exactly that; for although those who turned out these lovely new products from test tubes might have believed that one look was enough to convince any interior designer, this was definitely not the case!

True, interior designers were intrigued by these new products. The colors, the clarity and transparency, the unusual effects made possible when combined with light, many out-of-the-ordinary properties—all of these characteristics were points in favor of plastics, but still there was a hesitancy that almost verged on the borderline of stubbornness. Fortunately, for the material suppliers, they were not so much interested in making overtures to interior designers—at least not at that time. Their products were being used in other fields and by industry faster than they could produce them. To ignore the fields of architecture and interior design was not the thing to do, however, and the manufacturers realized this. Millions of dollars are spent every year by the members of these two professions, and while plastics might not have been ripe for all such applications just at that moment, they soon would be. So argued the material suppliers, and they began to pay heed to designers' inquiries.

The result has been rather phenomenal. From a group of people whose legend might have read: "None so blind as those that will not see," plus another group

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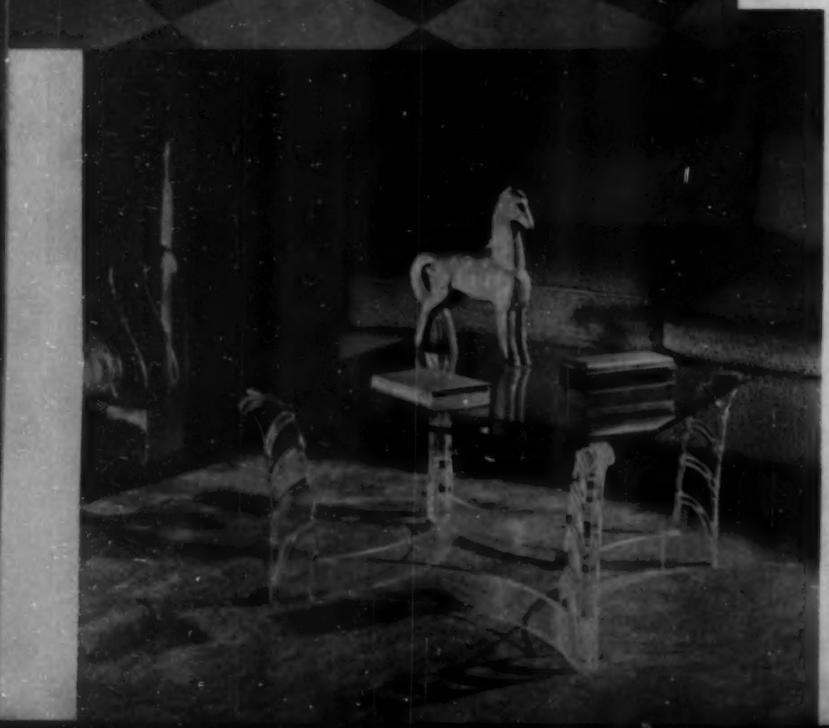

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7—The Greyhound Bus Terminal employs laminated plastics for their beauty and practicality. Column, counter fronts and counter tops are covered with laminated phenolic. Designed by Wischmeyer, Arrasmith & Ellswick. **8**—The brown and black floor in the Rockefeller Home Center "House of Ideas" is made of a vinyl-derived material that will wear forever. Pleasant underfoot, it is easy to maintain. **9**—An inviting fireside grouping with something new in acrylic andirons as well as a newly designed coffee table with carved plastic legs. **10**—Plastic table tops of the woven wood veneer type are beautiful as well as durable. Ideally suited for a cocktail lounge such as this, they are impervious to alcohol and cigaret burns. **11**—A feeling of immensity and tremendous height is created by the architectural treatment of the Brooklyn Central Library. Resin-bonded wood is used for the gigantic columns and walls. **12**—Dramatic and lovely is the Chicago salon of Lilly Dache with its lavish use of purple and chalk white. Chairs are tufted purple satin covered with a washable transparent vinyl material, the simply designed frames are white iron. Credits: Material—Formica, Lucite, Parkwood, Plexiglas, Tego bonded plywood, Vinylite. Fabricators—New York Art Iron Works, Swedlow Aeroplastics Corp., Grosfeld House, S. Karpen & Bros., American Furniture Novelty Co., Leo Prager

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whose attitude seemed one of indifference, has blossomed a spirit of genuine interest and cooperation. Manufacturers of plastics have not only encouraged designers to experiment with plastics for various designs, but have found it profitable.

Designers, on the other hand, have discovered to their delight—and surprise—that plastics are not fantastic creations, the by-products of some laboratory experiment. Furniture manufacturers who shied away from the use of such modern materials for Period styles are now incorporating many plastics into some of their finest creations—both Modern and Traditional.

The result of this awakened interest and harmony can be seen on these pages. We are happy to be able to present this collection of fine interiors, representing work by some of the country's finest interior designers.

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Plastics in Review

1 Without hunting in the dark, night callers can quickly spot this illuminated pushbutton. Enclosed in a durable brown phenolic, or ivory urea housing the device is ideal for professional offices or private homes. With no extra wires, it can be installed like a standard door bell. Supplied with a small lamp inside to illuminate the owner's transparent nameplate, house numbers and the transparent button itself, the device operates on all bells and chimes from 6 to 14 volts. Made by Eagle Electric Mfg. Co., Inc., of Bakelite, Durez and Beetle

2 High impact strength phenolic protects this intricate magneto coil. It consists of a winding placed in a casing formed by a piece of tubing and 2 molded end pieces or flanges. Through a small opening the trapped air is evacuated and an insulating compound injected to fill all spaces between the winding and its case, thus sealing the solid coil unit and winding against moisture. Winding terminal had to be fastened to an end piece demanding great strength. Edison Splitdorf Corp. molds the device of Durez

3 Pick a pea-green crocodile or a baby-blue gnu—hook it over your glass and this cellulose acetate Tinkle Tab will identify your drink. An animal fair of 20 colors, molded of Fibestos by Atlantic Plastic & Metal Parts Co., is packed merry-go-round fashion on a low cylinder and caged in a package of printed transparent Vuepak

4 See the writing on the wall—two rubber suction cups fasten these Note Master memo pads upright or grip the desk firmly. They're molded of grey Plaskon and walnut Bakelite or Durez by American Molding Co. with different mold inserts for special advertising or firm names for advertising purposes. Made by Everett Pulp & Paper Company

5 Ultimatic, a completely mechanical repeating pencil, automatically feeds a $2^1/_2$ ft. continuous lead for steady writing. Lightweight molded cellulose acetate barrel is grooved for comfortable grip. Made by Nahill Mfg. Co., Inc. in varied colors

6 Teacher's pet and teacher too, like the smooth finish and color of these Tenite blackboard eraser backs. Made with sponge rubber erasers, they're washable, tough and virtually indestructible. Molded by General Industries Co. for American Crayon Company

7 Carved intaglio plaques of clear acrylic, illuminated from any angle, spring to life with three-dimensional effectiveness. These are smooth-surfaced on 3 sides with a roughened carved interior and back, which is enhanced by the highlights on the transparent surface. An outgrowth of the scientific work in imbedding biological specimens done by Vernon-Benshoff Co., these decorative pieces, also created in relief, offer a new medium to the artist and sculptor. These African masks and prize fighter caricature were made of Plexiglas by Dr. Bernie Cooper

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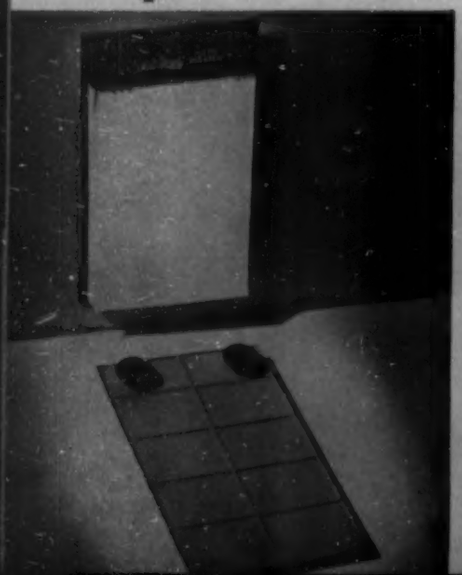

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8 A combined handle and mattress ventilator tube, this molded Velv-O-Grip is easily installed, hugs the mattress when not in use and can be handled without difficulty. Molded of Beetle by Northwest Plastics, Inc., for Self-Adjusting Mattress Handle Co. Colors are green, ivory, orchid, blue and rose. Inset shows ventilating perforations.

9 All cards in the Wind-O-File Visible Record Line are in plain sight and protected in their own self-contained pockets by a patented window of clear Lumarith Protectoid. This desk-blotter pad and card-file set, in two sizes, has spaces for memos and concealing flaps to cover the card system. Made by Newport Specialty Company

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10 Dainty scrap baskets, fragile-looking but sturdy in service are fabricated in a mottled pearl, tortoise shell, and black-striped crystal to blend with rich interiors. Made from Lumarith sheet stock by Dura Plastics

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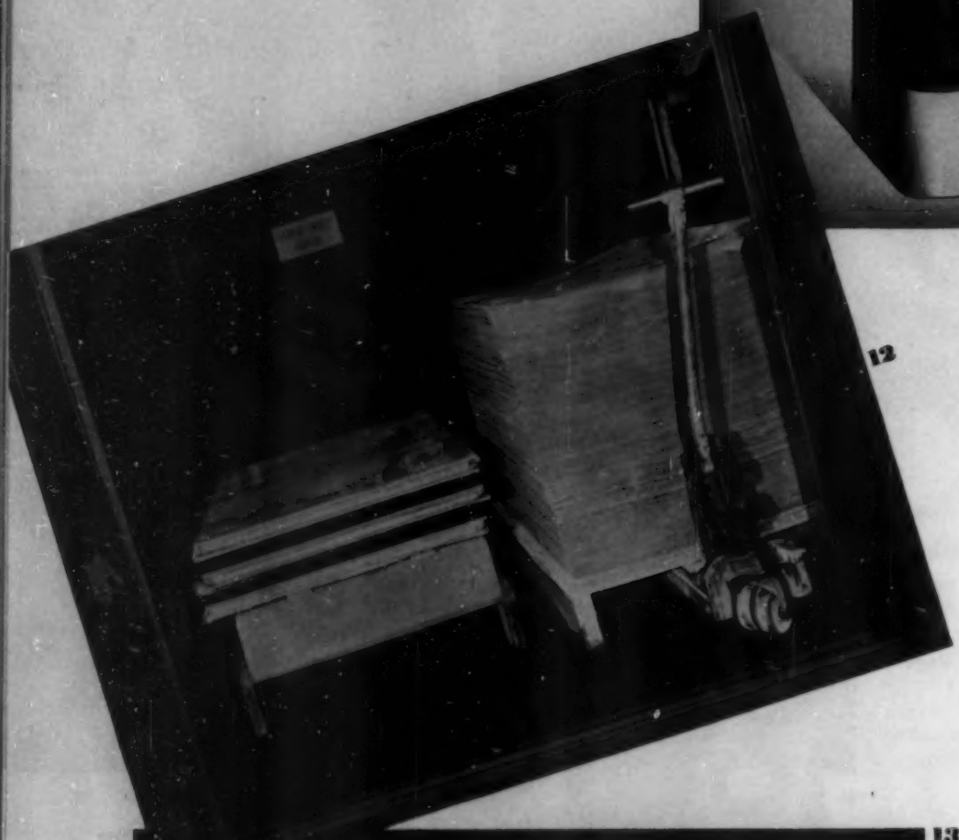

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11 This new G-E photoelectric relay with its compact molded Textolite cover will operate at speeds up to 150 interruptions per min. and at a minimum of 40 foot-candles at the phototube with not more than 15 foot-candles of extraneous light present. Applications include counting, sorting, weighing, measuring, controlling, signalling, inspecting and regulating when conditions permit. Molded by General Electric Company

12 Freight elevators get the toughest and heaviest kind of abuse. Wood floors generally last less than a year, but these Bakelite laminated Lamicoid floors show no signs of wear even after three years. Heavy loads are rolled on, shifted and started with comparative ease. A similar skidproof material is used in this factory for stair treads

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13 Featherweight yet strong and sturdy, this scoop is ideal for household use. Without spilling, half-cup portions or less of sugar, flour, salt, soap, coffee and other items, can be transferred from large containers. The handle is well shaped and solid. Mouth measures about 1 in. wide and increases to nearly $2\frac{1}{2}$ inches. Finish will not wear off through repeated use and washings. Molded of Durez by Norton Laboratories.

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Plastics in Review

14 Molded of Fibestos in two contrasting colors, this shaving brush has a man-sized grip that makes the brush easy to use. Tough and colorful, long service is assured despite frequent contact with soap and water. Handle is molded by Rubberset Co., Ltd., and the brush is displayed in a package made of Vuepak by American Box Company

15 Another example of how plastics are releasing metal for national defense is found in this strong molded nozzle for the "Speed-Master" vacuum cleaner. Not only is it lighter in weight, but it has much less abrasive action on wood finishes and delicate fabrics. The permanent lustrous finish is achieved in the mold. Molded of Tenite and Lumarith by Zenith Plastics, Inc. for Apex-Rotarex Corporation

16 A cocktail stirrer or pick to dress up a party drink, or carry advertising —this is made of a treated paper core enclosed in cellulose acetate by a special dipping process. Gay printed surfaces are clearly visible and are impervious to acids, alcohol and liquids. Material from Hercules Powder Co.; process by Neo-Plastics Company

17 Modern and sleek in design, easy to use, convenient to fill, this combination salt and pepper shaker is molded of Plastacele in cheerful color combinations—warm white dual body with red, blue, green or yellow base and filler cap. Designed by George Walker, the unit stands $2^{7}/_{8}$ in. high, is 3 in. long at the base and $1^{1}/_{8}$ in. wide. Filler holes have $^{3}/_{8}$ in. diameter. Available plain or with designs hand decorated in oils. Molded by Ward Plastic and Rubber Co.

18 A third dimensional quality achieved by using a clear sheet of Vinylite ribbed by a special embossing plate will make pictures seem more life-like. According to Nicholas T. Kaszab, inventor of the optical system, the subject is photographed from various angles on single standard color film in special camera; ribbed plastic sheet is placed accurately over film and the whole is sandwiched in glass, the glass behind film being frosted. Transparencies made by Stereogram Company

19 For bar or soda fountain, this colorful receptacle for beer scrapes or ice cream scoops has an attractive base molded of Lumarith. Clean water flows freely through an opening in the bottom of the glass, enters a jet and overflows in the top tier of the base. Easy to clean, the base is chip-proof and will withstand the gaff! Resistant to cleaning soaps and powders, it will always retain its attractive appearance. Made by Multi Products Tool Co. for Frank Schultz

20 Molded of Plaskon in a delicate shell pink, this container for face powder is a delight to the ladies. Base and screw-top cover fit closely and the sift-proof box was designed to "up" sales as well as add a decorative note to the dressing table. Molded by Norton Laboratories for Elmo Sales Corporation

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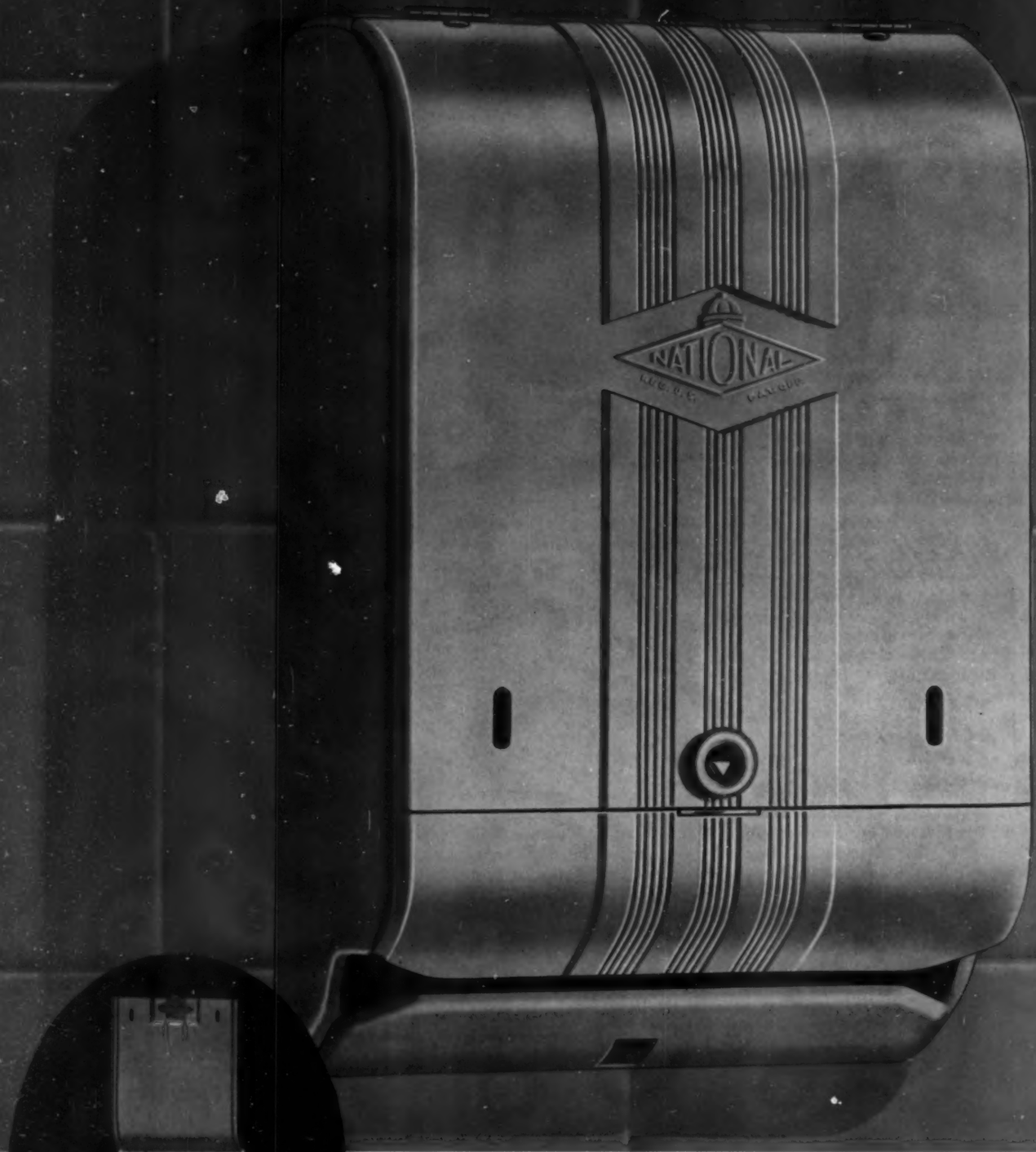
The FIRST Plastic



The National Toilet Tissue Cabinet, molded of pure white hygienic Plaskon, measures 8 inches in height, 5 inches in width, and 3 inches in depth. It is molded for the National Paper Products Company by the Plastics Division of the General Electric Company, Pittsfield, Mass.

toilet tissue cabinet

A STEADY PARADE of Plaskon Molded Color "firsts" is marching before the public eye . . . newly-designed products that embody distinctive manufacturing and sales advantages.

One of the most recent of these "firsts" is the National Toilet Tissue Cabinet, produced by National Paper Products Co., Division of Crown Zellerbach Corp.

The many distinctive features of Plaskon determined its selection for this modern washroom accessory. Principal among these features was the hygienic value of the Plaskon chosen, both in the nature of the material and its pure white color. The smooth, hard, lustrous finish is permanently inherent in the plastic compound. No polishing is necessary. A soft, slightly damp cloth is all that is needed to keep it brilliantly clean.

Plaskon will not chip, corrode, rust or tarnish, under ordinary service conditions anywhere. Its rich colors remain unchanged in depth of tone and unmarred in finish year after year.

Plaskon is light in weight, yet remarkably strong when properly molded for jobs where sturdiness is just as important as attractive color values. Plaskon will assure you fast, efficient, low-cost molding performance . . . will give you opportunity to build new sales volume through greater product appeal.

We shall be glad to give you the benefit of our technical experience in adapting Plaskon Molded Color to your production and sales-promotion needs. Write for a Plaskon representative to call upon you. Plaskon Company, Incorporated, 2121 Sylvan Avenue, Toledo, Ohio. Canadian Agent: Canadian Industries, Limited, Montreal, P. Q.

Trade Mark Registered

PLASKON

★ MOLDED COLOR ★

All-America

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THE Tenth Annual All-America Package Competition sponsored by *Modern Packaging* magazine drew over 30,000 entries from all parts of the United States. Plastics again played a major role, particularly in the transparencies. More and more packages, counter and window displays are employing transparent plastic sheets in various gages not only for the protection they afford to the merchandise but because the plastic enhances the appearance.

Three Top Awards were captured by plastic-housed items. One of these is familiar to us because it won an award in the Fifth Annual Modern Plastics Competition. This is the Tri-Pak Oil Dispenser. 1—Injection molded of Tenite II by Remler Co., Ltd., these containers are lightweight, unbreakable and leakproof. The label is printed on .005 gage, clear acetate sheet and placed inside for permanence. Fabricating was done by the Dobeckman Co. 3—A package for dental burs using molded Tenite II for the base and Tenite I for the cover also walked off with a top award for Lee S. Smith & Son Mfg. Co. Each package holds 6 burs and because the plastic is transparent, the dentist can locate and identify his requirements at a glance—no unnecessary opening and handling of containers while the patient waits in open-mouthed dread. The injection molded cover was designed with heavy sides and top to facilitate and guide the flow of material, thereby insuring a minimum of unsightly "weld" marks. Compact and convenient, each bur is so placed in the container that it is separated from the others, thus avoiding injury to the delicate cutting blades. The molding was by Erie Resistor Co. 2—Your One-A-Week Vitamin A Capsules from the Norwich Pharmacal Co. now come in a neat pocket-size package with a Lucite lid, and a base that is molded of Resinox, Bakelite and Durez.

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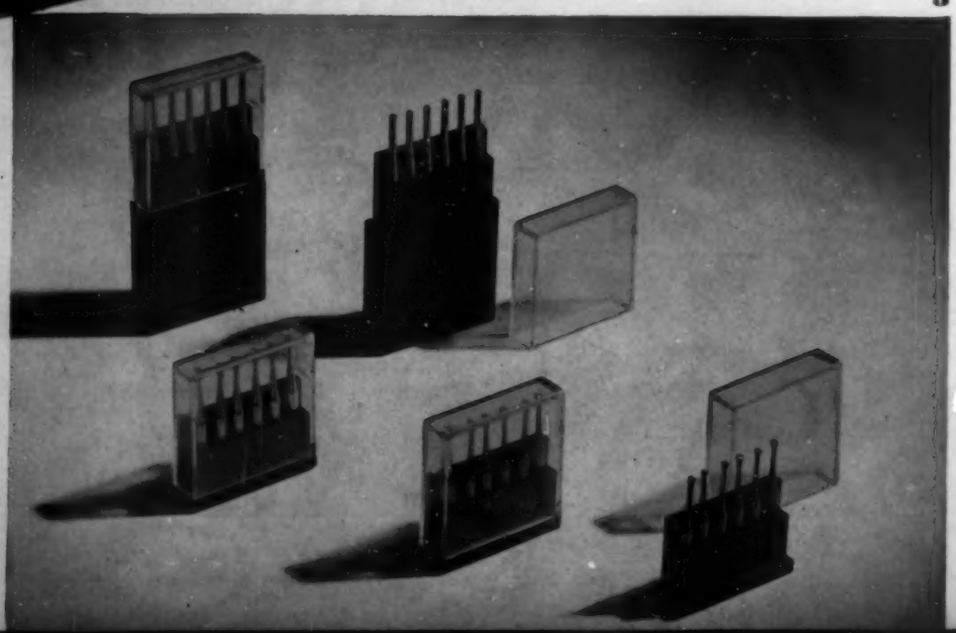

Plastics Winners

12 capsules are orange and show through the top. Cover was designed with setbacks and a raised strap effect across the top so as to avoid any tendency to warp. The cover of an insert-folder serves as the label. Molding by American Insulator Company.

Four Honorable Mentions include the J. B. Williams shaving stick holder (7) which has a non-corrosive cap molded of Durez. The use of plastic material not only makes a more attractive package, but the fact that it is not affected by constant contact with soap and water is an important consideration. There is no danger of the plastic part becoming dented, as the metal was prone to do. The molding was by Colt's Patent Fire Arms Co. **5**—Smart and exclusive, the Celares line of cosmetics from Saks-Fifth Avenue makes use of acrylic plastic, which allows a clear view of the contents. Massive in appearance, all of the containers are molded, with heavy sections that emerged from the molds without a blemish. The containers are filled as sold. Molded by Thomas F. Mason Co. of Crystalite. **6**—A silver chest, completely transparent and fabricated of Lucite by Swedlow Aeroplastics Corp. is a honey of a display item. Made for International Silver Co.—it certainly lends enchantment to the silverware, without an extraneous note. The clear methyl methacrylate cabinet lets the merchandise shine through, attracting attention to and selling itself. **4**—Filter boxes for Eastman Kodak Co. in the familiar black and brilliant yellow, molded by Norton Laboratories, Inc., also won an Honorable Mention. The base is of Bakelite assuring a lustrous surface and a durable one. The yellow cover is Tenite II, light-fast and wear-resistant. The strip threads on the cover and base are so designed that the cover is removed by a quarter turn. The design of the box is simple, to match the rest of the line.

7

6

5

4

All molders are invited to submit samples from stock molds to appear in this section as space permits

For manufacturers' names and addresses, write Stock Mold Department, Modern Plastics, Chanin Building, 122 East 42nd St., New York

Reprints of all stock mold pages which have been published to date with a complete index of suppliers are available to Stock Mold Service Subscribers

Stock molds

SHEET ONE HUNDRED-FIVE

Premium items obtainable at low cost from stock molds include sturdy flashlights, gay charms and jewelry, key rings, knives and colorful cocktail muddlers

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1319. Flashlight, 8 in. in length, 3/4 in. deep, threaded rim. Lens diameter 2 in. Embossed ribbed finish with 1 1/2 in. switch button and threaded end plug. Varied colors with contrasting trim

1320. Junior size flashlight, same as above. Overall length 6 1/4 in. Lens diameter 1 3/4 in. In colors

1321. Charm pocket pieces 1 3/16 in. diameter. Embossed horoscope symbols on one side, dates on reverse side. Supplied with gold-plated ball key chain. Available in varied colors

1322. Hotel return key tag with embossed mail box illustration and instructions to "drop in any mailbox" on one side; face allows for hotel lettering. 2 5/8 in. long; 1 1/4 in. wide

1323. Mustard spreader, overall length 3 31/32 in., paddle width 3/4 in., variety of colors; suitable for cocktail pick also

1324. Blade-extension knife, 3 5/8 in. long. Metal knob on handle releases blade to four extension positions. Overall length at fourth position, 5 9/16 in. Widest point of handle 5/8 inch

1325. Razor knife 4 3/8 in. long when opened; handle 2 9/16 in. long. Blades easily changed when dull. Available in iridescent colors

1326. Key holder with novel trigger action. Keys carried inside handle; 2 9/16 in. long; dia. of rounded end 31/32 in.; four-key size unless otherwise specified

1327. Standing and flat miniature animals in variety of colors, about 3/4 in. long. Can be made with straight pin, safety pin or staple

1328. Highball muddlers 6 in. long with varied figured tops. Available in blue, red, yellow and green

New mica-resin molding compound developed by TVA

by LYNN L. McMURRAY*

The following report is based on experiments in which a beneficiated mica obtained from mica schist ore was used as the principal ingredient in molded compositions. The properties of the molded compositions are given and compared with various insulating materials. It was found that the molded compositions made from schist mica were characterized by high dielectric strength and good resistance to corrosion and water absorption. The additions of high percentages of schist mica to phenolic resins do not reduce the power losses as much as might be expected.

THE Minerals Research Division of the Tennessee Valley Authority has conducted laboratory investigations directed toward the best utilization of fine mica from mica schists. These ores are treated by the froth flotation methods to recover a pure mica. This mica appears useful for several applications; one of these applications is its use as an essential ingredient in a molding composition. The mica is naturally fine-sized, smooth-surfaced, and apparently has improved electrical properties over the ordinarily used ground micas. This report deals with work done on plastic molding materials composed of this beneficiated mica.

The treatment given the mica ore consisted of: (1) grinding the ore in mullers to liberate the mica from impurities, (2) froth floating the mica in pure form, (3) leaching the mica with acid to remove adhering clay or iron oxide when necessary, and (4) washing and drying. As the ore is naturally in fine-sized flakes, very little grinding was necessary, and so the small plates were not cracked or roughened. After this treatment a screen analysis was made, the results of which are shown in Table I (a). As it was found that even finer sizes gave better properties to the finished molded material, this mica was reground to sizes shown in Table I(b). Both of these sizes of mica were used in making the molded compositions.

* Tennessee Valley Authority.

TABLE I. SCREEN ANALYSIS OF MICA FROM SCHIST

(a) Coarse Mesh	Percent	(b) Fine Mesh	Percent
Minus 48, Plus 60	2.3	Plus 100	6.2
" 60, " 80	7.9	Minus 100, Plus 150	9.1
" 80, " 100	8.1	" 150, " 200	14.3
" 100, " 150	13.7	" 200, " 325	20.7
" 150, " 200	20.3	" 325	49.7
" 200	47.7		100.0
	100.0		

For a comparison of the mica from schist and the ordinarily used ground scrap mica, molded specimens containing each type were made. The screen size and purity of the two types of mica were almost identical, and both were used with the same resin in order to have identical conditions. Table II shows that apparently the mica from schist has an inherently higher dielectric strength.

Many types of resins were molded with the mica, but it was decided to confine the study to the resins of the

TABLE II. DIELECTRIC COMPARISON OF MICA FROM SCHIST AND GROUND SCRAP MICA

Composition	Specimen No.	Kilovolts at Puncture	Thickness in Mils	Volts per Mil
(a) Ground scrap mica	1	53.0	127	425
70% mica	2	54.5	128	425
30% resinoid B	3	57.5	127	455
	4	41.5	127	325
	5	51.5	128	405
			Average	405
(b) Mica from schist	1	58.5	121	485
70% mica	2	54.0	124	435
30% resinoid B	3	55.0	126	436
	4	62.0	120	515
	5	65.5	121	540
			Average	482

TABLE III. CORROSION TESTS ON MICA-RESIN MATERIAL[a]

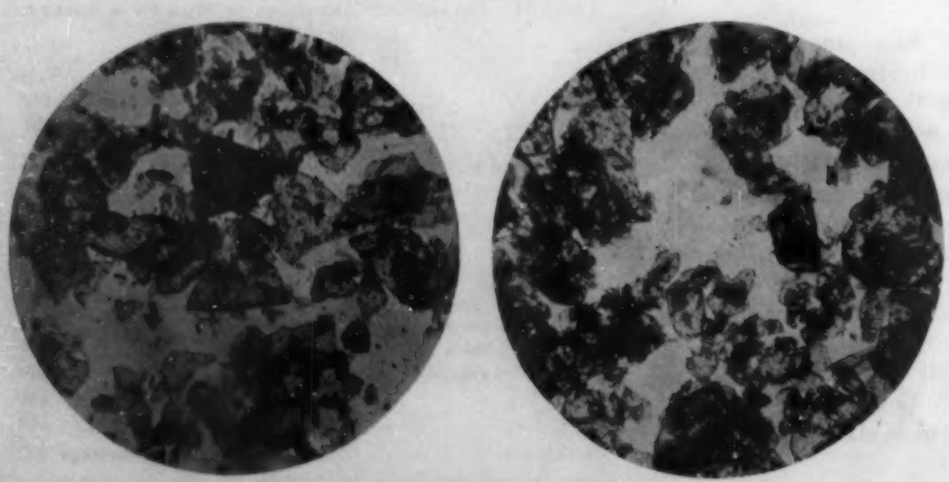
Chemical	Concentration Percent	Increase After 10 Days Immersion Weight Percent	Increase After 10 Days Immersion Thickness Inches	Increase After 30 Days Immersion Weight Percent	Increase After 30 Days Immersion Thickness Inches	Increase After 90 Days Immersion Weight Percent	Increase After 90 Days Immersion Thickness Inches	Increase After 180 Days Immersion Weight Percent	Increase After 180 Days Immersion Thickness Inches
Sulfuric acid	20.0	1.53	0.000	1.53	0.002	2.30	0.005	3.32	[b]
Nitric acid	1.0	1.04	0.000	1.52	0.001	1.52	0.001	[c]	[c]
Hydrochloric acid	20.0	1.91	0.000	2.29	0.001	2.29	0.001	2.29	0.002
Phosphoric acid	20.0	0.77	0.000	1.15	0.001	1.92	0.002	1.92	0.005
Acetic acid	20.0	0.00	0.000	0.00	0.001	0.77	0.001	0.77	0.003
Citric acid	20.0	0.38	0.000	0.76	0.001	0.76	0.001	0.76	0.001
Zinc chloride	20.0	0.00	0.000	0.00	0.000	0.00	0.000	0.00	0.000
Ferric chloride	20.0	0.00	0.000	0.38	0.000	0.38	0.000	0.38	0.001
Sodium hydroxide	1.0	0.77	0.001	[d]	[d]	[d]	[d]	[d]	[d]
Potassium permanganate	7.1	0.83	0.000	0.83	0.000	0.83	0.000	0.83	0.000
Potassium dichromate	13.5	0.38	0.000	0.38	0.000	0.38	0.000	0.38	0.000
Sodium phosphate	13.7	0.00	0.000	0.00	0.000	0.38	0.002	[e]	[e]
Sodium thiosulfate	20.0	0.38	0.000	0.38	0.000	0.38	0.000	0.38	0.000
Gasoline	100.0	0.38	0.000	1.15	0.000	1.15	0.001	1.15	0.001
Tap water	100.0	0.00	0.000	0.00	0.000	0.00	0.000	0.37	0.001

[a] This material was made from 70 percent mica from schist with screen analysis as shown in Table 1(a) and 30 percent resinoid B. The test specimens were 2 in. by 1 in. by 1/4 in. and the edges were sanded smooth. The specimens were completely immersed in the liquids and the temperature was kept at 68 deg. F. The weight was measured to the nearest 0.1 gram and the thickness calipered to the nearest 0.001 of an inch at the periods indicated.
[b] Swollen.
[c] Swollen, removed.
[d] Specimen removed, badly corroded.
[e] Badly corroded at 135 days.

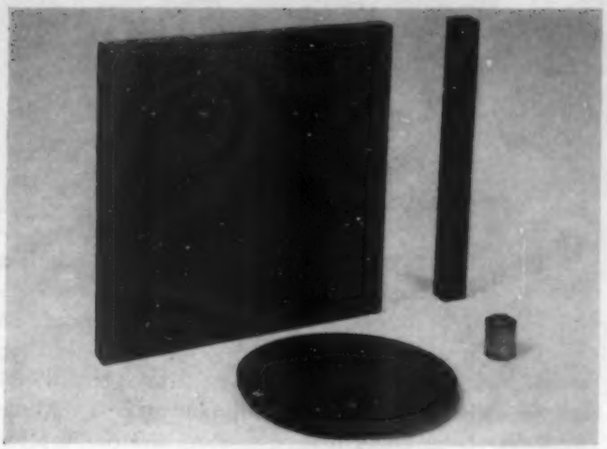
phenol type as these seemed to show the most promise. After a few of these resins were made in our laboratory, it was decided to purchase standard resins from manufacturers. Two resinoids were finally adopted for the tests and will be listed as resinoids A and B. These resins, of the phenol type, contained all the essential ingredients of a molding powder except the filler. The mica was added as the filler. At first only the usual filler percentages (around 40 percent) were added to the resins, but it was found that higher percentages of mica gave compositions with the best electrical properties. Compositions containing as high as eighty percent mica have been made, but for most satisfactory molding a composition with seventy percent mica and thirty percent resin was adopted. This composition has a mold flow about equal to that of most mineral-filled compositions, and no difficulty was experienced in making the molded specimens.

The resin was incorporated with the mica by both wet and dry mixing. In the wet mixing, the resin was dissolved in acetone and the mica was stirred into this solution, a method which allowed each mica flake to be coated. The solvent was then evaporated by gentle heating. In the dry mixing, the dry resin powder was mixed with the dry mica in a pebble mill. Inasmuch as no difference was found in the strength and electrical properties of the compositions made by wet and by dry mixing, the latter method was used almost exclusively on account of its simplicity.

The specimens for the tests were prepared according to the usual molding procedure. A temperature of 150 deg C. to 160 deg C. was maintained by the use of electrically heated platens, and a pressure of 2000 lb. per sq. in. was applied. The curing time in the mold was longer than for other common mineral-filled compositions, but it is believed that this difference was due



Underground mica produced from schist ore is seen in the magnified micrograph (left), showing the transparency and smooth edges of the mica flakes. Ground scrap mica flakes (right) have round edges and lack the transparency



Molded mica resin specimens consisting of a compound of 70 percent mica from schist and 30 percent phenolic resin

TABLE IV. DIELECTRIC STRENGTH OF MICA-RESIN PLASTIC[a]

Specimen	Kilovolts at Puncture	Thickness Mils	Volts per Mil
1	80[b]	104	Over 770
2	82[b]	117	" 700
3	81[b]	122	" 670
		Average	" 710
	After 48 hours in water		
4	87	120	720
5	93[b]	113	Over 820
6	93	115	810
		Average	780

[a] This material was composed of 70 percent fine-sized schist mica and 30 percent resinoid A.
[b] Flashed over.

TABLE V. DIELECTRIC CONSTANT AND POWER FACTOR OF MICA-RESIN PLASTIC

(a) At 60 cycles (after 96 hrs. at 50 percent relative humidity and 79 deg. F.)	
Specimen no.	7
Average thickness, inch	0.1198
Effective area, sq. in.	8.3
Dielectric constant (S.I.C.)	6.5
Power factor	0.068
(b) At 1 megacycle (after 96 hrs. at 50 percent relative humidity and 79 deg. F.)	
Specimen no.	7
Average thickness, inch	0.1198
Effective area, square inch	8.3
Dielectric constant	5.4
Power factor	0.012

TABLE VI. SURFACE AND VOLUME RESISTIVITY TESTS

(a) Surface resistivity (after 96 hrs. at 50 percent relative humidity and 79 deg. F.)	
Specimen no.	7
Electrodes, total length, cm.	20.3
Insulation resistance, megohms	8880
Surface resistivity, ohm-cm.	1.8×10^{11}
(b) Volume resistivity (after 96 hrs. at 50 percent relative humidity and 79 deg. F.)	
Specimen no.	8
Average thickness, cm.	0.304
Electrode area, sq. cm.	31.6
Insulation resistance, megohms	48,000
Volume resistivity, ohm-cm.	5×10^{12}

TABLE VII. GENERAL PROPERTIES OF MATERIAL

Tensile strength[a]	6,000 lbs. per sq. in.
Flexural strength	10,000 " " " "
Heat resistance (continuous)	135 deg. C.
" " (short periods)	200 deg. C.
Specific gravity	1.85
Bulk factor	2 to 1 (approximate)
Preforming qualities	Poor
Mold flow	Similar to most mineral-filled compositions

[a] These test specimens were cut from a molded sheet of material. Values are, therefore, probably low.

to the greater percentage of filler. The curing time is roughly one-fourth longer than for other mineral-filled molding compostitions.

Cost estimates made on the mica-resin materials indicated that the cost of mica alone would be about one cent per pound, and the total cost of the molding compound less than ten cents per pound. The cost of the molded article would, of course, depend upon its design, shape, size, and other factors.

The accompanying tables give some of the properties of the mica-resin materials made in the laboratory. Table II, as mentioned previously, compares two different types of mica, one material composed of mica from schist ore and the other of ground scrap mica. Table III shows the corrosion-resistance properties of a material composed of 70 percent coarse schist mica, screen analysis (a) in Table I, and 30 percent resinoid B. Tables IV, V, VI, and VII give the electrical and physical properties of the fine-sized schist mica, screen analysis (b) in Table I, in a composition of 70 percent mica and 30 percent resinoid A. In Table VIII various electrical insulation materials (*Please turn to page 98*)

TABLE VIII. ELECTRICAL PROPERTIES OF VARIOUS INSULATING MATERIALS

	Laboratory Mica-Resin	Porcelain	Ceramic Talc	Glass	Mica-Glass Composition	Woodflour-Filled Phenolic Molded
Power factor, percent	60C: 6.8 1MC: 1.2	1KC: 1 1MC: .7–.8	1MC: .06–.2 10MC: .04–.18	1KC: .28–1 1MC: .2–.95	1MC: .2–.23	60C: 4–30 1MC: 3.5–10
Dielectric constant	5.4–6.5	6.0–7.5	5.8–6.2	5–9	7.5–8.3	5–12
Dielectric strength, volts per mil	1/8": 700	0.2": 280	1/4": 200–240	1/16": 400	0.2": 340–360	1/8": 300–500
Volume resistivity, ohm-cm.	5×10^{12}	1×10^{14}	$1 \times 10^{14-15}$	1×10^{12}	5×10^{13}	$1 \times 10^{10-12}$

This table was compiled from various sources and represents the limits of the different types of materials manufactured.

Films and plastics from starch

by J. SEIBERLICH*

The production of transparent plastics from starch has been mentioned in press releases several times during the past few years. These reports have come from scattered points, notably the Netherlands and Maine. One of the chemists connected with the project in Maine was invited to report on the progress made to date in the utilization of starch as a raw material for the manufacture of plastics. At the conclusion of the author's discussion of this subject, some facts and figures are presented regarding the extent of the manufacture of potato starch in the United States and the present industrial uses of this material.

THE manufacture of transparent films and plastics from starches seems at first glance a quite uneconomical process. But studying more closely the properties of this raw material, the conclusion may be drawn that this new product might be of great commercial advantage. The potato-growing farmer, for instance, has always had great difficulty in disposing of the second grade potatoes and culls. Almost no value is attached to these products. If the potato grower knew that he might find a market for his culls, he could select only the best potatoes for table use and therefore could secure a better price and easier competition. On the other hand, when starch is manufactured from these potatoes, and starch films and other plastic products are produced, a new outlet is created for a surplus farm product for industrial uses.

Starch films

When the properties of starch are compared with those of bleached wood pulp as the raw material for films like cellophane, many other advantages arise from the use of starch for this purpose. While wood pulp is largely manufactured from trees of 15 to 25 years of age by the cooking process, starch is harvested every year, thus conserving valuable forest land and also securing a more uniform product as raw material. Cellulose manufactured from pulp wood grown at different places and heights or cut at different periods of the year shows many fluctuations of its composition and properties. The manufacture of starch, a cold wet process, is simpler and more economical than the pulping process which involves cooking in digesters with alkalies or acids for many hours. The starch is not chemically bound with its surrounding tissue, as is the case with the lignocellulose, thus assuring a more uniform product. A valuable by-product is obtained in the preparation of starch from potatoes; namely, the potato cellulose. This cellulose is a pure white substance, suitable for preparing cellulosic products. It is also well suited for a filler for plastics, especially because of its great absorbency.

* Seiberlich Chemical Corp.

In processing, too, there are advantages in using starch as a base material for transparent film production. It is not possible to transform the cellulose into a clear transparent film without going through the complicated xanthation process. But glass-clear starch films can be obtained by preparing the starch solution and allowing it to dry. No setting baths, etc., are required, as is the case in the cellophane process. Much work has been done in investigating the preparation and properties of starch films, and more work is still required to secure successful commercial production.

F. D. Farrow and E. Swan[1] have prepared films in order to study the water absorption of the dried films. They have obtained thin non-adherent sheets of cooked starch by drying pastes on very slightly greased plates of aluminum and other materials. These films, according to the authors, were transparent, white and flexible under ordinary atmospheric conditions. If they were placed in a dry atmosphere, they became brittle. Later S. M. Neale[2] investigated the tensile strength of films made from various starches. In order to reduce their brittleness, soap, castor oil, glycerol, and the like were added, but these substances also reduced the tensile strength of the starch films. Methods for testing the strength of starch films were developed and described by F. T. Pierce,[3] W. Seck and R. Brem,[4] and M. S. Fury.[5]

A commercial manufacturing process for starch films was suggested by H. A. Levey.[6] Realizing the great hygroscopicity of such starch films, he recommends the application of coatings on both sides of the film in order to avoid rapid changes in water content. The starch film to be coated is prepared by boiling the starch until the granules are broken down. A cellulose lacquer is used for the coating.

Later,[7] Levey found that for many purposes, a coating on one side of the starch film is sufficient. Since starch is very absorptive, therapeutical substances may be added and such films may find use as medical dressings.[8] Many other uses have also been suggested.[9]

In all of these processes, the coating is applied for improving not only the water equilibrium but also the tensile strength, since, according to the methods described in the literature, it is very difficult to prepare self-sustaining starch films from pure starch.

M. F. Moeller[10] tried to overcome the susceptibility of starch films to absorb or lose moisture in wet or dry atmospheres, respectively, by transforming the

[1] Shirley Inst. Mem. *2*, 329 (1923).
[2] Shirley Inst. Mem. *3*, 207 (1924).
[3] J. Text. Inst. *19*, T237 (1928).
[4] Kolloidchem. Beih. *45*, 99 (1936).
[5] U. S. Dept. Agriculture Tech. Bull. 674 (1939).
[6] U. S. P. 2,012,344 (1935).
[7] U. S. P. 2,137,168 (1936).
[8] U. S. P. 2,137,169 (1936).
[9] U. S. P. 2,137,170 (1936) and 2,137,171 (1936).
[10] French P. 826,881 (1938).

A view of the experimental laboratory where plastics from starch were developed and tested

starch before or during the casting of the film into a formaldehyde starch which is more water resistant than ordinary starch. Stein Hall Manufacturing Co.[11] goes still further by incorporating urea in the formaldehyde-starch mixture in order to obtain better self-sustaining properties. Such starch solutions are also recommended for coating papers and fabrics. A similar process was used by G. H. Osgood and R. G. Peterson[12] for the manufacture of adhesives. As condensation agents in the urea-formaldehyde-starch mixture, zinc chloride and zinc sulphate are employed. A complete film-casting machine of the belt type for manufacturing starch films was designed by W. and J. Moufang[13] which shows great similarity to those film-casting machines already in use for the casting of cellulose acetate films. F. Eichmann and H. Nerard[14] first reduced the original starch granule in a colloid mill, and then prepared hydrosols from it by the use of magnesium chloride, sodium hydroxide, and similar materials. The casting is carried out on the usual type of film-casting machine.

In summarizing the work done on starch film up to the present, the following conclusions may be drawn. Films made from starch under ordinary conditions remain opaque and brittle. Films made from starch after the granules are almost completely disintegrated show good transparency but remain brittle. Considerable work remains to be done to reduce the brittleness by incorporating suitable plasticizers and also to improve the tensile strength. But in any case, the effect of various degrees of moisture on starch will be the same as on the normal cellophane. Starch and cellulose, in their natural state, are hygroscopic and this property is also transferred to pure starch films. This, of course, does not mean that coating the film in a suitable and economical way or incorporating water-repellent substances into the starch solution would not lead to a commercially profitable industry.

Starch plastics

The white starch is a potential raw material for plastics because chemically it is a polysaccharide, just as cellulose is. But the first step to be taken in manufacturing starch plastics is to reduce as far as possible its solubility, i.e., its swelling property in water. Many attempts have been made to render starch insoluble. In 1896, A. Classen[15] treated starches with formaldehyde and claimed insolubility for the product. What he really produced, however, was a starch product which had lost its ability to form a paste by heating in water. Stolle and Kopke[16] have experimented in the same direction, retaining the form and shape of the starch grain. Their results show that a reaction between starch and formaldehyde takes place, resulting in a so-called formaldehyde starch, which has lost most of its paste-forming property. While all of these experiments have dealt with rendering starches insoluble, the Herold A. G.[17] claims the use of such starches for casting plastics. For this purpose, starch is brought in reaction with formaldehyde in the presence of accelerators, as, for instance, lactic acid, phthalic anhydride, and the like. The semi-liquid mass is poured into forms and allowed to harden. I. Thorn[18] went one step further and incorporated urea with the formaldehyde starch. According to his process, ten to sixteen parts of starch are mixed with one part of urea and three parts of formaldehyde. The nearly dry mass is then pressed at 120–150 deg. C. and further drying after pressing is recommended. The final product is translucent. F. Schmidt[19] dehydrates urea-formaldehyde condensation products by kneading these products with a certain amount of starch. The addition of dioxy ethyl toluidine is also recommended to improve the end product.

The Ellis Foster Co.[20] incorporates starches and flour in a formaldehyde-urea resin together with a plasticizer. Molding conditions are 3500 lbs. per sq. in., heating 5 min. at 140 deg C. A similar process is used by E. C. Loetscher.[21] He replaces urea-formaldehyde resin by a phenol-formaldehyde resin and he applies the starch not in its natural state but after bursting the granules with an alkali compound. R. A. van Linge[22] produces plastics from potato starch and paraformaldehyde. The mixture is treated in an autoclave at about 100 deg. C. and is afterwards mixed with equal amounts of urea and formaldehyde. The plastics produced by this method are transparent or opaque, and quite hard. They are used in the button industry. It is also claimed that the waste material may be used over again. Their properties are related to those of the casein type of plastic, being still not completely water-resistant. E. E. Novotny and C. J. Romieux[23] have obtained a molding compound by heating starch with phenol. There is reason to believe that a condensation takes place between (*Please turn to page 98*)

[11] U. S. P. 2,212,314 (1940).
[12] U. S. P. 2,141,313 (1938).
[13] French P. 836,380 (1939).
[14] Ger. P. 672,357 (1939).
[15] Ger. P. 92,259.
[16] Ger. P. 201,436.
[17] Ger. P. 507,997.
[18] Ger. P. 569,343.
[19] Ger. P. 591,045.
[20] U. S. P. 2,121,076 (1938).
[21] U. S. P. 1,959,433 (1934).
[22] Dutch P. 44,502.
[23] U. S. P. 1,815,930 (1931).

Vacuum technique in molding

by LES PFAHL*

NUMBERED among the headaches of the injection molder are the rejects caused by burn spots, frog skin, high porosity, weld lines and other defects resulting from gas and moist air trapped in the die cavity by the onrushing wave of hot plastic. Now, however, an extremely high, dry vacuum system has been developed which will evacuate all air and gases from the die cavities and so remove this source of trouble. The die wall space is free to plasticize the molten material which may flow along under favorable conditions and weld with itself at meeting points without obstruction. Maximum detail of the die wall finish and form is also obtained.

The high, dry vacuum is controlled by a solenoid operated by the lever that controls the plunger. Evacuation begins when the stroke for the pressure forces the plastic into the die, and is discontinued automatically as the return stroke of the plunger is initiated. A storage tank maintained at about 0.5 in. barometric pressure serves as the vacuum reservoir. The piping connecting this reservoir with the die must be carefully computed as to length and diameter in order that the full force of the vacuum may be utilized.

The problem of venting the dies also requires careful consideration and has been reduced to a formula involving the volume of the cavity to be evacuated and the size of the groove in the die which serves as a temporary reservoir for the escaping gases. This vent must be wide rather than deep, relatively speaking.

In addition to removing the trapped air which causes physical defects on the molded pieces, the use of this vacuum technique in injection molding also helps to eliminate differences in the behavior of the plastic attributable to variations from day to day in atmospheric temperatures and relative humidities. Since there is a vacuum, the conditions within the mold remain about the same whether it is wet or dry, hot or cold in the outside world.

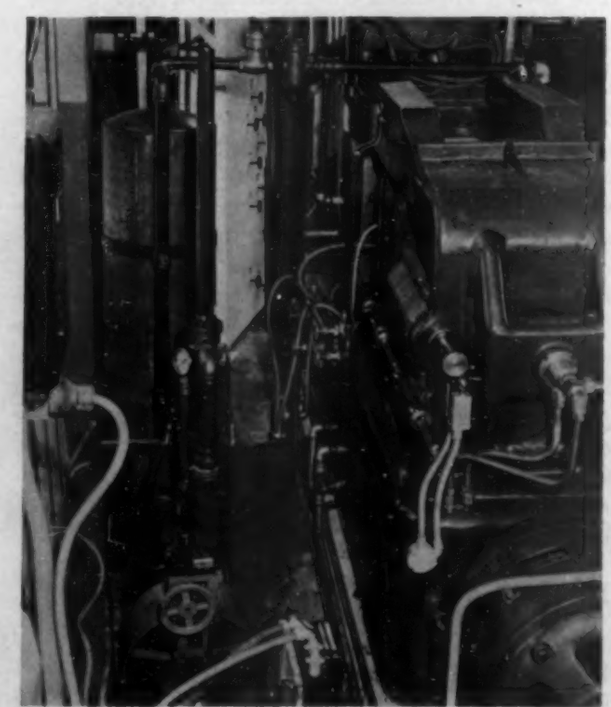
A new roto-piston dry vacuum pump, of entirely different design than any other vacuum pump on the market, is said to retain all advantages of rotary construction and have the operating characteristics of the reciprocating piston type. This pump has a rotating assemblage, the exterior case rotates in unison with the interior rotor, turning in the same direction at the same angular velocity and uses air as a cooling agent, thus maintaining a constant load in perfect balance.

The rotor turns with the case, but on an eccentric slightly aside from the common center of the case, the rotor holding a constant rolling motion contact with the case by a seal ring carried in the rotor side. A vane recessed in the rotor and slotted through the periphery wall maintains a flat, constant seal against the inner wall of the case. This vane separates the intake from the exhaust chamber. Air enters through the hollow fixed shaft, passes through the interior of the rotor and, as the case and the rotor revolve clockwise, a charge of air is sucked into the crescent chamber back of the vane which is always sealed. As the revolution continues the crescent chamber continually decreases, pushing air out through the exhaust port.

At the point of contact of the vane and the case the vane travels one inch and a quarter forward travel and reverses to the point of beginning with each full revolution of the case, the sharp squared end of the vane contacts a flat surface of the case of $1\frac{1}{4}$ in., the vane's full travel. Because the case and rotor revolve in the same direction and at the same angle of velocity, a right angle seal is maintained at all times and a cycle of operation is accomplished by $\frac{1}{24}$ of the stroke or complete case revolution.

The "Crescent" Pump, fully protected by basic patents, has been made for over 15 years and is in successful operation in a wide variety of industries.

This typical installation of vacuum accessory equipment on an injection molding press is one of many that have been made in numerous plants



* Cresent Vacuum Sales Co.

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Tenite packages are strong and durable—forming permanent, protective cases for delicate products. Their light weight makes them inexpensive to ship and convenient to carry.

Products may be easily identified by using transparent Tenite packages which allow a clear view of the contents, or by using packages molded in the brand color. A 28-page illustrated book showing some of the many uses of Tenite will be sent on request.

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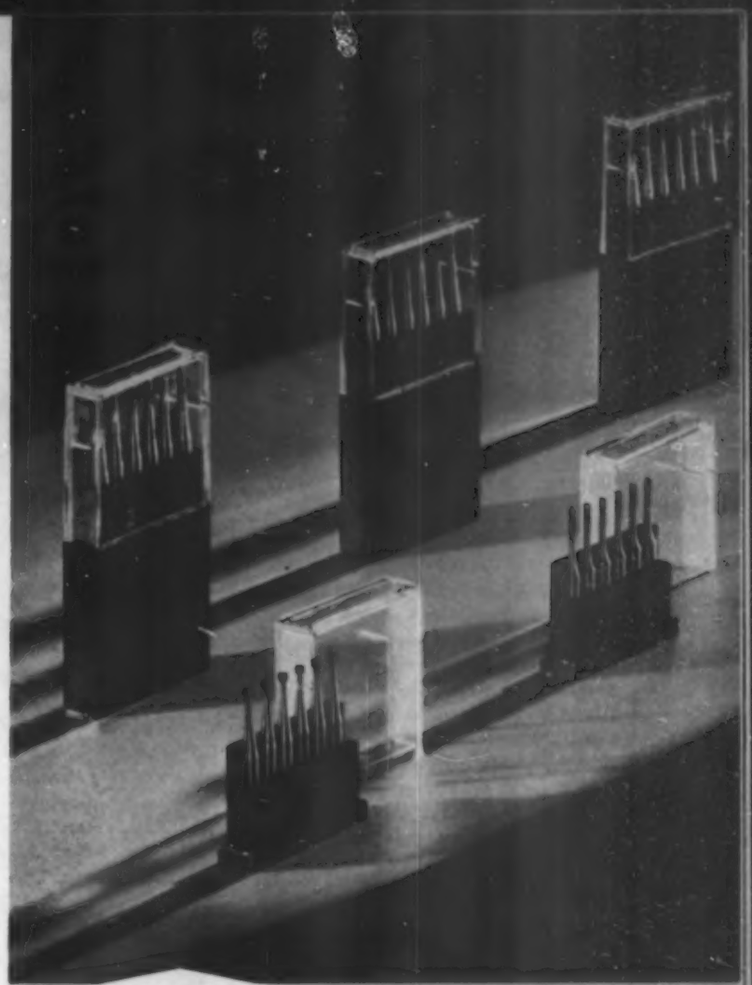
TENNESSEE EASTMAN CORPORATION

Kingsport, Tenn. ***Subsidiary of the Eastman Kodak Co.***



TOP AWARD . . . to Tenite dental bur boxes. The transparent cover enables the dentist to see at a glance what type of bur the box contains. Molded by Erie Resistor Corp. for Lee S. Smith & Son Mfg. Co.

TOP AWARD . . .

to transparent Tenite oil bottles. The attractive and practical design of this shatterproof package led to a 400 per cent increase in sales of the oil. Molded by Remler Co., Ltd., for Tri-Pak Gun Kit, Inc.

HONORABLE MENTION

. . . to camera filter boxes. The brand name is molded in relief on the yellow Tenite top, the color associated with this brand of products. Molded by Norton Laboratories, Inc., for Eastman Kodak Company.

Plastics digest

This digest includes each month the more important articles (wherever published) which are of interest to those who make plastics materials or use them. Requests for periodicals mentioned should be directed to the individual publishers.

General

THE INDUSTRY IN 1940. British Plastics *12*, 247–53 (Jan. 1941). The year 1940 has been one of outstanding importance in the history of the British plastics industry. The rationing of timber due to import restrictions and the diversion of light alloys into the field of armament production necessitated the development of plastics for many new applications. Laminated materials as well as moldings are playing an increasingly prominent part in the manufacture of essential war equipment and especially in aircraft construction. The importance of plastics to the national war effort has been fully recognized by the Government and Service Departments by the appointment of a Controller of Plastics and an Aircraft Plastics Committee. The molding trade has very definitely adjusted itself to the new requirements and has attempted to reconcile itself to what at first seemed ridiculous demands with regard to time factor for tooling and bulk pressings. Materials brought into bulk use without proper time for trial and error, fortunately have answered the purpose. The whole industry through the incident of war has had presented to it possible developments in fields which would have taken twenty years to accomplish under normal peacetime conditions. Its members look forward to happier circumstances when there will be a freedom to publish particulars of the rapid progress of these times without the danger of imparting information of value to an enemy.

NEW ALGINATE FIBERS. Chemical Age *44*, 39 (Jan. 11, 1941). Sodium alginate solution, made from alginic acid recovered from seaweed, is forced through spinnerets into a slightly acidified calcium chloride coagulating bath. The yarn can be rendered insoluble in warm water and soda solution by treatment with beryllium acetate solution. A colorless yarn of satisfactory strength and dyeing properties is produced.

Materials and Manufacture

PHENOLIC RESINS. A. D. Sokolov and N. S. Zarubina; L. M. Pesin and Ch. G. Khasanov; G. S. Petrov and M. B. Grimberg. Org. Chem. Ind. (USSR) *7*, 228–31, 318–9, 331 (1940). *Transparent Moldings;* In making transparent articles from resols without filler, strength can be increased by supplementary heating after molding. Flow of the molding powder must not be increased too much because strength is impaired thereby. Moldings from novolaks may have excellent strength from powders of high flow, but supplementary heating adds nothing to strength. *Thermal Course of Resinification;* The heat effect in exothermic condensation of phenol with formaldehyde to the resol stage with ammonia as the condensing agent is approximately 80 calories per gram or about half that of the condensation to the novolak stage with hydrochloric acid as the condensing agent. *Recovering Phenolic Molding Scrap;* Waste from molding can be recovered by a preliminary treatment with ammonia or a solvent, followed by blending with a novolak type resin.

(Mimeographed translation available from Hooker Scientific Library, Central College, Fayette, Mo.)

Molding and Fabricating

METALLURGICAL PROGRESS. British Plastics *12*, 254, 256 (Jan. 1941). Special alloys developed for dies, tools, and presses are discussed. A new die steel for relatively short runs contains approximately 1.0% carbon, 5.0% chromium, 0.2% vanadium, and 0.5–1.0% molybdenum. It does not distort to any appreciable extent, so that grinding after hardening has in numerous cases been eliminated. Savings up to 40% in die cost have been effected.

COMPOUNDING WOOD AND PLASTICS BY A NEW PROCESS. R. Decat. Aero Digest *38*, 146, 149, 194 (Feb. 1941). Wood and phenolic resins are combined into a new molded product which has a high strength-weight ratio and resistance to moisture, acids, and oils. The heat for curing is developed by an ultra-high frequency unit which induces heat in the center of the block. A 4-inch-thick block requiring 2 hours for curing by the old method now is finished in about ten minutes. The production of airplane propellers and aircraft skis by this method is described.

SAFETY FEATURES ON MILLS AND CALENDARS FOR RUBBER AND PLASTICS. J. Milward. India Rubber World *103*, 35–6 (Jan. 1941). A discussion of the types of safeguards available and their proper location on the process equipment.

Applications

GATKE SLIPPER BEARINGS FOR UNIVERSAL COUPLINGS. Steel *107*, 62–3 (Dec. 30, 1940). Special molds have been perfected for molding fabric-base slipper bearings to the finished size in order that the severe wear may be taken by the dense wear-resisting molded surfaces. On large blooming mills where great shocks and frequent reversings occur, a set of molded slipper bearings is still in service after 3 years of continuous operation. Metal slippers gave only 2 to 3 months' service.

DECORATIVE PLASTICS FOR AUTOMOBILES. W. J. McCortney. Ind. and Eng. Chem. *33*, 237–9 (Feb. 1941). This paper is one of six comprising a "Symposium on Automobile Finishing." Experiences encountered in the selection and use of plastics on Chrysler cars are set forth. Tests which plastic parts must undergo to qualify are outlined. The hot and cold test comprises 24-hour cycles at −40 deg. F., 175 deg. F. dry heat, −40 deg. F., and finally 175 deg. F. at 65–70% relative humidity. The other papers in the symposium are concerned with automotive protective coatings.

DEVELOPMENT OF A PLASTIC MOLDED AIRPLANE. H. P. Moon. Aviation *40*, 44–5, 140, 144 (Jan. 1941). An illustrated description of the Vidal process for molding aircraft.

PLASTICS IN PLACE OF LEATHER. F. Stather and H. Herfeld. Kunststoffe *30*, 253–60 (Sept. 1940). Materials developed to replace leather in its various applications are reviewed. Leather is also on the strategic list of materials in the United States, much of our domestic supply being imported from South America.

Properties and Testing

INVESTIGATION OF INDENTATION HARDNESS OF PLASTICS. W. Kuntze. Kunststoffe *30*, 323–36 (Nov. 1940). Various machines, indenters, loads, and durations of loading were investigated. It is concluded that a diamond or steel pyramid is the most suitable type of indenter. Indentation hardness values for many plastics, metals, and glass are tabulated.

MEASUREMENT OF THE ELASTIC MODULUS OF PLASTICS. W. Kuntze and F. Pfeiffer. Kunststoffe *30*, 293–6 (Oct. 1940). Apparatus of Le Rolland-Sorin for determining the modulus of elasticity of many types of materials by a pendulum method is described. Data for various plastics are presented in graphs and tables.

WATSON-STILLMAN INJECTION MOLDING MACHINES

Many other manufacturers like this producer of molded plastic pieces find Watson-Stillman Injection Molding Machines unexcelled for producing large quantities of molded parts economically.

Users find that exclusive features incorporated in these outstanding W-S machines make for extreme flexibility and unusual accuracy with higher quality and quantity production resulting at lowest costs.

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If you are interested in lower cost methods of molded plastics production, you will find a Watson-Stillman Injection Machine best suited to meet your requirements. Available in standard capacities of 6, 8, 12 and 16 ozs. Write for further information.

help keep this plant at peak production

In the modern plant of the Hemco Plastics Division of the Bryant Electric Company at Bridgeport, Conn., the WATSON-STILLMAN INJECTION MOLDING MACHINES above are shown molding Dictaphone mouthpieces.

These up-to-date machines are of a compact, self-contained design. Operation is practically automatic, yet extremely simple to control. Molded parts are smooth, clean and true to size. The highest standards of uniformity and quality are assured in a wide range of shape and size of molded parts.

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U. S. plastics patents

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 10 cents each

ACRYLATE RESIN. E. B. Thomas and H. F. Oxley (to Celanese Corp. of America). U. S. 2,226,645, Dec. 31. Reacting chloretone with an alcohol in presence of a strong acid or alkali to form a methacrylate ester.

COLORED THERMOPLASTICS. L. H. Morin and D. Marinsky (to Whitehall Patents Corp.). U. S. 2,227,461, Jan. 7. An improved method and apparatus for intermittently casting different colored thermoplastics, which are fed into the mold chamber from separate cylinders.

CHLOROPRENE. H. W. Starkweather and A. M. Collins (to E. I. du Pont de Nemours and Co.). U. S. 2,227,517–8–9, Jan. 7. Emulsion polymerization of chloroprene or its homologs in presence of a small proportion of an unsaturated compound to form plastic polymers capable of vulcanization to highly elastic products.

ROSIN DERIVATIVE. J. H. Long (to Hercules Powder Co.). U. S. 2,227,548, Jan. 7. Condensing a phenol-aldehyde or phenol-ketone resin with an alkyl abietate to form a low-melting, flexible varnish resin.

RESIN. W. Zerweck and M. Schubert (to I. G. Farb. Akt.). U. S. 2,227,618, Jan. 7. Forming a resin by condensing an aldehyde with a phenylol or naphthylol derivative of urea or thiourea.

INSULATION. R. Engelhardt (to I. G. Farb. Akt.). U. S. 2,227,637, Jan. 7. An impregnating and insulating composition of highly chlorinated diphenyl and about 7.5 percent of polyvinylcarbazole.

STRIPED FOILS. W. Wade (to Sylvania Industrial Corp.). U. S. 2,227,682, Jan. 7. Extruding two plastic compositions in alternate streams through a common extrusion head, one composition containing a reagent capable of forming a colored compound with a reagent in the other composition so that a colored stripe appears where each stream of plastic meets its neighbor.

THERMOSETTING RESIN. E. H. Balz (to Plaskon Co.). U. S. 2,227,693, Jan. 7. Adding 1,8-naphthalic anhydride to a thermosetting urea-formaldehyde resin as a latent accelerator.

THERMOSETTING RESINS. D. E. Cordier (to Plaskon Co.). U. S. 2,227,708–9, Jan. 7. As latent accelerators in thermosetting urea resins, the borneol, menthol or polyglycol esters of aromatic sulphonic acids; or alkyl or glycol esters of an alkali metal acid thiosulphate.

RESINIFIED RUBBER DERIVATIVES. C. A. Redfarn and P. Schidrowitz (to British Rubber Producers' Research Assoc'n). U. S. 2,227,797, Jan. 7. Heating rubber with a phenol and maleic anhydride, and condensing the reaction product with an aldehyde to form a resin.

POLYSTYRENE. R. R. Dreisbach (to Dow Chemical Co.). U. S. 2,227,808, Jan. 7. Polymerizing styrene or its homologs in contact with an activated decolorizing earth by adding the monomer to the liquid polymer.

SEPARATING RESINS. Richard Hessen. U. S. 2,227,885, Jan. 7. Fractionating a resol to obtain a high-molecular resin of uniform consistency by dissolving the crude resol in hot alcohol and precipitating with water.

INJECTION MOLD. H. T. Emsley (to Eastman Kodak Co.). U. S. 2,227,966, Jan. 7. A device for injection molding has a mold cavity formed partly in the ejector half and partly in the cover half through which the plastic is passed into the mold.

ACETAL OR KETAL RESIN. W. O. Kenyon and W. G. Lowe (to Eastman Kodak Co.). U. S. 2,227,975, Jan. 7. Condensing a partially hydrolyzed polyvinyl acetate resin with an aldehyde or ketone.

ACETAL RESIN. H. B. Smith (to Eastman Kodak Co.). U. S. 2,227,983, Jan. 7. Rubbery transparent foil containing a polyvinyl acetal resin plasticized with dibenzyl glycol ether.

STABILIZING ACETALS. D. R. Swan (to Eastman Kodak Co.). U. S. 2,227,985, Jan. 7. Use of a water-soluble thiosulphate as stabilizer in polyvinyl acetal resins.

COATED METAL. H. A. Winkelmann and E. W. Moffett (to Marbon Corp.). U. S. 2,227,991, Jan. 7. Bonding chloroprene to metal with rubber hydrochloride, to form a laminated sheet material.

POLYVINYL ALCOHOL. H. Berg (to Chemische Forschungsgesellschaft m. b. H.). U. S. 2,227,997, Jan. 7. Hydrolyzing a derivative of vinyl alcohol in presence of sufficient solid to make a plastic of the resulting polyvinyl alcohol.

PLASTICIZER. S. L. Bass (to Dow Chemical Co.). U. S. 2,228,222, Jan. 7. Plasticizing ethylcellulose with 5 to 40 percent of tri-*p-tert.*-octylphenyl phosphate.

INTERPOLYMER. H. Hopff, W. Starck and K. Billig (to General Aniline and Film Corp.). U. S. 2,228,270, Jan. 14. Emulsion interpolymerization of vinylmethylketone with crotonic acid in the ratio 70:44 in presence of potassium persulphate and hydrogen peroxide.

VINYL RESIN COATING. G. Wick and A. Hoff (to I. G. Farb. Akt.). U. S. 2,228,332, Jan. 14. Coating objects first with after-chlorinated polyvinyl chloride, then (under heat and pressure) with a polyvinyl chloride foil lacquered with after-chlorinated polyvinyl chloride.

SMOKE FILTER. Ernst Berl. U. S. 2,228,383, Jan. 14. Using a fibrous highly substituted cellulose ester or ether for filtering tobacco smoke.

ANION EXCHANGE RESIN. R. Griessbach, H. Wassenegger, K. Brodersen, A. Rieche and H. Maier-Bode (to I. G. Farb. Akt.). U. S. 2,228,514, Jan. 14. Resins for anion exchange reactions are made from alkylated or aminoalkylated aniline, *m*-phenylenediamine or *m*-aminophenol by condensation with an aldehyde.

(Please turn to next page)

* An outstanding recent development
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SHEETS, RODS, TUBES,
FABRICATED PARTS

RESIN FROM SULPHITE LIQUOR. H. John (to Paper Patents Co.). U. S. 2,228,567, Jan. 14. Precipitating a resin from waste sulphite liquor with an arylamine and an aldehyde.

CURING RESINS. L. D. Soubier and J. R. Hoge (to Owens-Illinois Glass Co.). U. S. 2,228,614, Jan. 14. A machine for curing and molding synthetic resins is equipped for preheating the compressed resin charge in its path from the charging orifice to the mold.

VINYL RESIN PLASTIC. L. P. Kyrides (to Monsanto Chemical Co.). U. S. 2,228,666, Jan. 14. Plasticizing a vinyl resin with a neutral ester of a ketoalcohol (with or without a different alcohol) and a dicarboxylic acid.

LINEAR MOLDINGS. Geo. S. Edmonson. U. S. 2,228,-721, Jan. 14. A machine for making straight line moldings from synthetic resins has a hydraulically operated loading sleeve.

DECORATIVE PLAQUE. L. T. Frederick (to Richardson Co.). U. S. 2,228,921, Jan. 14. Making ornamental resin panels in a pressing pan in which different colored compositions are joined in a laminated product.

MOLDING COMPOSITION. H. J. Reboulet (to Mead Corp.). U. S. 2,228,976, Jan. 14. Forming a lignin molding composition from black liquor by neutralizing the liquor with carbon dioxide, washing the precipitate and acidifying it with a strong acid.

VENETIAN BLIND SLAT. G. Schneider (to Celanese Corp. of America). U. S. 2,229,225, Jan. 21. A laminated Venetian blind slat is made in three layers of cellulose organic derivative.

BLENDED RESIN. H. J. West (to American Cyanamid Co.). U. S. 2,229,265, Jan. 21. Blending rosin with an alcohol reaction product of an aminotriazine-aldehyde resin.

DICYANDIAMIDE RESIN. F. J. Groten and J. H. Lower (to American Cyanamid Co.). U. S. 2,229,291, Jan. 21. A molding composition containing a resin derived from dicyandiamide, a phenol and an aldehyde.

DRY SEALING TAPE. Paul Van Cleef (to Van Cleef Bros.). U. S. 2,229,316, Jan. 21. Pressure-sensitive adhesive tape is made of paper, faced with an adhesive and backed with ethylcellulose foil.

TREATED FIBER PRODUCT. G. E. Wightman and E. Kritzmacher (to Union Carbide and Carbon Corp.). U. S. 2,229,357, Jan. 21. A fibrous composition having a binder and having deposited on the fibers a hydrophilic thermosetting phenolic resin.

DRY CELL ANODE. G. H. Young (to Stoner-Mudge, Inc.). U. S. 2,229,431, Jan. 21. A metal anode for dry cells is faced with a resin which is permeable to ions but electronically is a nonconductor.

CAN LINING. J. W. Raynolds (to Raolin Corp.). U. S. 2,229,602, Jan. 21. Lining food cans with a baked film of rubber chloride petronized with a derivative of urea, thiourea, dithiocarbamic acid, mercaptothiazole, guanidine or the like.

MOLDINGS FROM SHEET PLASTICS. C. B. Strauch (to Plax Corp.). U. S. 2,229,613, Jan. 21. Localized heating of a portion of an organic plastic sheet, and shaping of the heated area into molded articles.

CELLULOSE TRIACETATE. H. L. Wampner (to Commercial Solvents Corp.). U. S. 2,229,617, Jan. 21. Forming clear solutions of cellulose triacetate in nitromethane and an alcohol.

SAFETY GLASS. A. Weihe and A. Voss (to General Aniline & Film Corp.). U. S. 2,229,781, Jan. 28. As an interlayer in laminated glass, an acetal resin derived from a polymer containing hydroxyl and carboxyl groups.

ABRASIVE ARTICLES. H. V. Allison (to Allison Co.). U. S. 2,229,880, Jan. 28. A bond for abrasive grains comprises a thermosetting resin and a butadiene:acrylonitrile interpolymer.

ELECTRIC INSULATION. P. Nowak and W. Dietloff (to General Electric Co.). U. S. 2,229,985, Jan. 28. Covulcanizing polyethyl acrylate with 5–35 percent of its weight of plasticized rubber reclaim to form waterproof, ozoneproof, age-resisting elastic insulation.

TETRAHYDROFURYL ACRYLATE. H. V. Claborn (to the People of the United States). U. S. 2,229,997, Jan. 28. Tetrahydrofuryl acrylate, for making a polyacrylate resin, is obtained by pyrolysis of tetrahydrofuryl alpha-acetoxypropionate.

INSULATING FOILS. O. Hauffe and W. Wehr (to Deutsche Celluloid-Fabrik). U. S. 2,230,000, Jan. 28. Blending after-chlorinated polyvinyl chloride or polystyrene in strong, smooth sheets which withstand hot rolling without softening.

LENSES. H. R. Moulton (to American Optical Co.). U. S. 2,230,118, Jan. 28. Forming ophthalmic lenses from an organic thermoplastic.

UREA RESIN. Fritz Pollak. U. S. 2,230,121, Jan. 28. Forming a water-soluble hardenable urea resin from methylolureas and ammonia.

PLASTIC. Hermann Basler. U. S. 2,230,127, Jan. 28. Compounding a synthetic resin emulsion with mechanically and chemically degraded organic fibers and with aluminum wool to make a molding composition.

HOLLOW ARTICLES. E. T. Ferngren (to Plax Corp.). U. S. 2,230,188–9–90, Jan. 28. Improvements in machines for forming blown hollow articles from organic plastics which can be rigidified after blowing.

RESIN DISPERSIONS. J. K. Boggs (to Hercules Powder Co.). U. S. 2,230,230, Feb. 4. Dispersing a fusible terpene-modified alkyd resin in water by forming a water-soluble salt of the resin.

VINYL RESIN. H. L. Gerhart (to United Gas Improvement Co.). U. S. 2,230,240, Feb. 4. Forming a resin by heating a vinyl compound with maleic anhydride or a derivative thereof.

TERPENE RESIN. Israel Rosenblum. U. S. 2,230,266, Feb. 4. Condensing a phenol with formaldehyde in presence of dipentene, turpentine, borneol or terpineol to form an oil-soluble resin.

AMINE RESIN. A. G. Hovey and T. S. Hodgins (to Reichhold Chemicals, Inc.). U. S. 2,230,326, Feb. 4. Condensing dioctylamine with adipic acid to form a fast-curing water-white resin.

(Foreign plastics patents follow on the next page)

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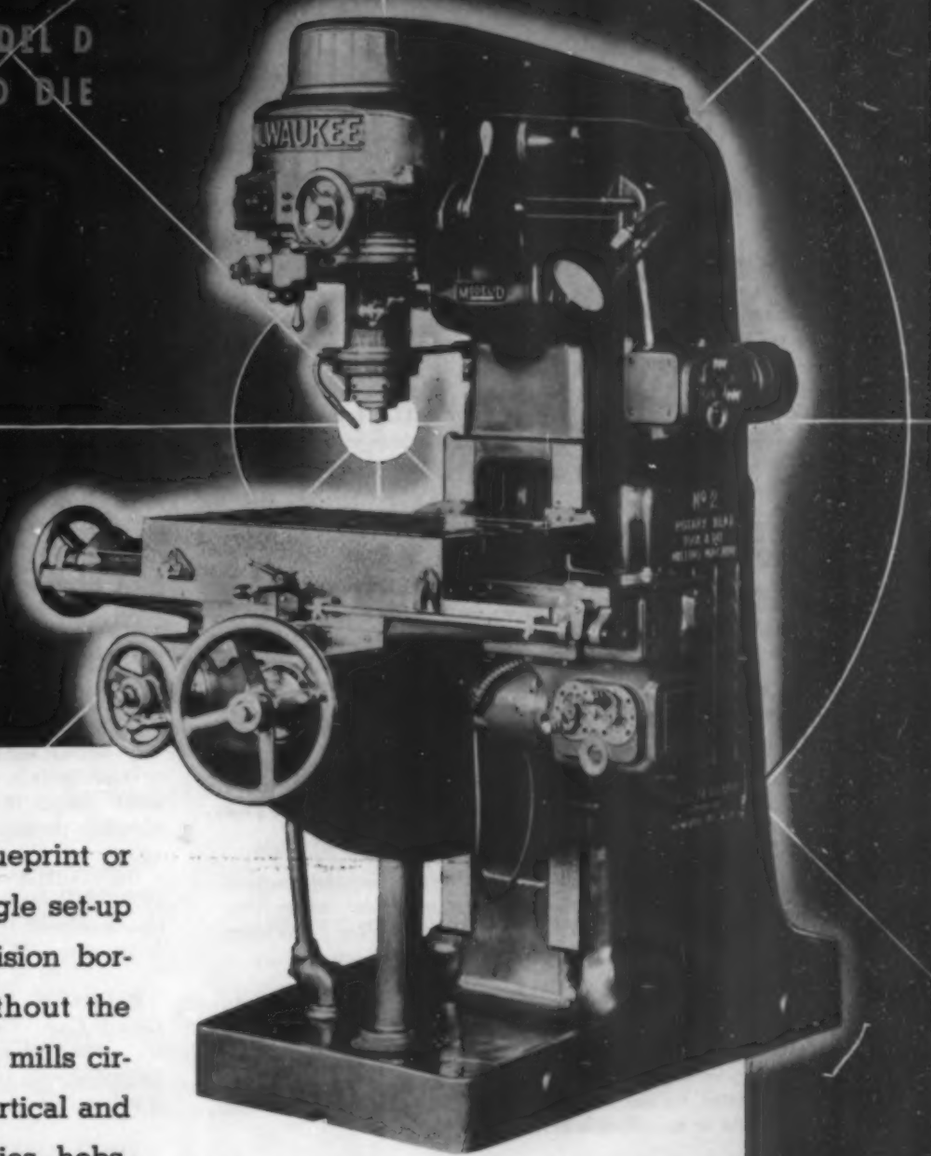

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Foreign plastics patents

Application dates are given for patents of European countries, but for Canada the issue date is given

TREATING TEXTILES. De Angeli-Frua Societa per l'Industria dei Tessuti Stampati. Italian Patent 357,518, Dec. 24, 1937. Localized laundry-fast sizing or coating of fabrics with synthetic resins.

CELLULOSE DERIVATIVES. Societa Rhodiaceta Italiana Patent 356,752, Nov. 30, 1937. Pigmentation of cellulose ester plastics, foils or filaments is effected by blending a heavily pigmented batch with an unpigmented batch; carbon black and titanium dioxide are among the suitable pigments.

SAFETY GLASS. Libbey-Owens-Ford Glass Co. Italian Patent 356,087, Oct. 16, 1937. Safety glass interlayers comprising polyvinyl acetal resins plasticized with sebacic acid or its alkyl or alkoxyl esters.

CEMENT FOR MOLDINGS. A. Fischer. Italian Patent 356,954, Dec. 13, 1937. A cement for attaching wood or metal to synthetic resin moldings utilizes a parchment paper membrane which is impermeable to the liquefied synthetic resin formed by softening the surface of the molding.

WATER PURIFIER. I. G. Farb. Akt. Italian Patent 356,025, April 8, 1937. Condensing arylamines with aldehydes to form resins which serve as anion exchange medium in water purification.

ARTIFICIAL LEATHER. Carl Freudenberg. Italian Patent 352,239, June 16, 1937. Impregnating a fibrous web with a thermoplastic vinyl or acrylate resin to make a leather substitute.

POLYETHYLENE PLASTICS. Imperial Chemical Industries, Ltd. Belgian Patent 433,748, 1939. Molding ethylene polymers under pressure at temperatures at or above the melting point of the polymer.

ACRYLATE RESINS. Imperial Chemical Industries, Ltd. Belgian Patent 434,047, 1939. Resins formed by polymerizing alpha-chloroacrylic acid or a derivative thereof are molded, with or without plasticizers and pigments.

FIBROUS CASINGS. Heinrich Prüfer. German-Austrian Patent 157,957, Aug. 15, 1939. Making tubing and casings from paper impregnated with a gelatin solution containing 2–8 percent of a urea-formaldehyde resin.

TREATING PLASTICS. G. Martin, R. Thiolet and A. Chomette (to S. A. des matieres colorantes et produits chimiques de Saint-Denis). French Patent 842,158, June 7, 1939. Plastics formed by action of sulphur chloride on oils such as castor oil are dechlorinated by autoclaving with water and urea, hydrazine, cyanamide or an alkanolamine.

FILM SUPPORTS. Kodak Pathe. French Patent 842,066, June 5, 1939. Polyvinyl acetal resins for use in film supports are stabilized by treatment with a hydroxylamine or an oxime or nitrous acid in dilute solution.

IMINOACID RESINS. I. G. Farb. Akt. French Patent 842,176, June 7, 1939. Condensing nitrillotriacetic, iminodiacetic, iminodipropionic or ethylene-bis-iminodiacetic acid with glycerol, polyglycerol or mannitol in presence or absence of phthalic anhydride.

VINYL RESINS. I. G. Farb. Akt. French Patent 842,339, June 9, 1939. Plasticizing vinyl resins with a phosphate such as tritolyl phosphate and a benzoate, chlorobenzoate, phenylbenzoate, phenylacetate or phthalate of glycerol, glycol, polyglycerol or polyglycol.

UREA RESINS. I. G. Farb. Akt. British Patent 510,682, Aug. 4, 1939. Resins are formed by heating methylolurea or methylolthiourea with maleic anhydride or a dicarboxylic acid imide.

PLASTICS. Silesia Verein Chemischer Fabriken. British Patent 510,666, Aug. 4, 1939. Condensing ethylene dichloride with sodium polysulphide in presence of a small proportion of ethyl bromide and magnesium hydroxide

CONTAINERS. Remy, van der Zypen & Co. British Patent 510,488, Aug. 2, 1939. Metal bands to be folded for forming side seams of jam tins, pails or canisters are coated with a thermoplastic formed from a phenol-formaldehyde resin, a filler and paraffin wax; the coating is applied along the top of one edge and the bottom of the other edge.

GAS MASK WINDOWS. Henry Dreyfus. British Patent 510,802, Aug. 8, 1939. Transparent eye pieces for gas masks are made of partially hydrolyzed cellulose acetate plasticized with dimethyl phthalate.

SAUSAGE CASINGS. Naturinwerk Becker & Co. German Patent 682,491, Oct. 17, 1939. Forming a highly swollen mass of animal fibers, shaping it in tube form and treating with dehydrating and hardening agents.

POLYVINYL ALCOHOL. Chemische Forschungsgesellschaft m. b. H. German Patent 686,123, Jan. 3, 1940. Polyvinyl alcohol and derivatives thereof which are soluble, swellable or emulsifiable in water are treated with a dye such as Congo red which changes the mechanical, thermal and colloidal properties as well as the color of the resin.

DENTURES. Chas. S. Ballard. Can. P. 392,982, Dec. 10, 1940. Molding synthetic resin dentures in a thin-walled plaster matrix encased in a metal shell having high heat conductivity so the thermoplastic resin can be softened by conducted heat.

ELECTRIC CABLE. M. M. Safford (to Canadian General Electric Co.). Can. P. 393,025, Dec. 10, 1940. Jacketing electric cables with plasticized polyvinyl chloride foil, asbestos impregnated with plasticized polyvinyl chloride, and finally with aluminum foil.

VINYL RESIN. C. Schönburg (to I. G. Farb. Akt.). Can. P. 393,152, Dec. 10, 1940. Separating after-chlorinated polyvinyl chloride from its solvent by chilling till the solution forms a gel, extruding the gel into a bath for removing the solvent, and drying the treated gel.

HIGH WET-STRENGTH PAPER. M. O. Schur (to Brown Co.). Can. P. 393,326, Dec. 24, 1940. Imparting high wet-strength to paper, while retaining flexibility, by incorporating less than 2% of a thermosetting urea resin in the paper and heating to set the resin.

Plastics ITI

TEACHES THEORY OF PLASTICS AS WELL AS PRACTICAL TRAINING

At the same time they learn the actual use of plastics through practical shop and laboratory training, students at Plastics ITI receive a broad education in the theory of plastics.

The instruction includes correct industrial usage of plastics, based on the physical, chemical, electrical and optical properties of each material. It embraces the history and development of the plastics industry, classification of materials and methods of production.

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The comprehensive training given by Plastics ITI deals with all phases of this industry's activities, in equally complete and practical manner. In addition to theory and engineering courses, the curriculum includes the fundamentals of metal mold design, molding, laminating, fabricating, casting and rubber molds, plant layout, and methods of testing and research.

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Publications

Write direct to the publishers for these booklets. Unless otherwise specified, they will be mailed without charge to executives who request them on business stationery. Other books will be sent postpaid at the publishers' advertised prices

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New Dictionary of Chemistry

Edited by Stephen Miall

Longmans, Green & Co., Inc., 55 5th Ave., New York, 1940
Price $15.00 **575 pages**

This volume contains brief accounts concerning many chemical substances, chemical operations, drugs, vitamins, and other bodies of biochemical importance, and also includes biographies of many notable chemists of the present and past generations. These were prepared by specialists in the respective fields under the direction of the Editor of "Chemistry and Industry" whose editorials have for some time entranced and encouraged us, particularly those philosophical contributions of more recent date pertaining to life and thought in a country at war. With such able guidance a compilation of accurate information on chemical matters has been provided which is certain to be useful not only to chemists but also to engineers, executives, patent attorneys, journalists, and professionals branches of science. G. M. K.

Popular Home Decorations

by Mary Davis Gillies

Published by Wm. H. Wise & Co., 50 West 47th St., New York, 1940

Price $2.95 **320 pages, 200 illustrations, 17 color plates**

Aimed at those who own or rent homes costing under $10,000 or who occupy moderate rental apartments, this attractive book, 8½ by 11 in. in size, is a practical working guide for millions of homemakers of middle-bracket income who wish their rooms to reflect good taste and comfort. Inspired by inquiries received by the author as interior decorating editor of *McCall's Magazine*, this volume suggests new ideas and recommends the use of numerous materials such as plastics, alloys, resins, synthetic fabrics, paints, etc., which were unknown a few years ago. Facts and figures on actual furnishing costs are given and the exceptionally fine photos, many by Martin Bruehl, stress the use of color, particularly obtainable with modern products. H. B. J.

● A 68-PAGE CATALOG, PRESENTED WITH A NATURAL color fibrous cover, a plastic comb binding, the title, *Textolite*, and G-E trademark printed in a maroon shade, has been issued by the Plastics Dept., General Electric Co., Pittsfield, Mass. Well illustrated, the catalog is organized into ten sections: Raw Materials, Development, Designing and Engineering, Mold Making, Molding, Laminating and Fabricated Parts, Industrial Design, Commercial Policy and Accomplishments, Properties of Textolite Molded, and Properties of Textolite Laminated. Photographs of scenes in the research laboratory, the toolroom: shots of the gigantic presses, the design department and many finished products which the company has produced, serve to illustrate the complete line of facilities at hand for the customer.

● MICA INSULATOR CO., 200 VARICK ST., NEW YORK, has issued an informative brochure describing translucent Lamicoid sheet material and illustrating some recent applications of the material for lighting and color effects. Copies are available to business executives upon request.

● AN ATTRACTIVE 24-PAGE BOOKLET, ENTITLED "Injection Molded Plastics" published by Elmer E. Mills Corp., 812 W. Van Buren St., Chicago, presents in descriptive and pictorial form the facilities of this molding company, and illustrates in four-color and black and whites some of the products made. In addition, the characteristics, formulations and uses of thermoplastics are discussed in easily understandable fashion. The technique and advantages of injection molding are outlined and shown diagrammatically.

● A 30TH-ANNIVERSARY CATALOG OF ATLAS MAchine tools and shop equipment has been just released by Atlas Press Co., Kalamazoo, Michigan. This attractive new 72-page book includes complete information on 1941 models of Atlas lathes, drill presses, arbor presses, and shapers, and announces two new machines—a compact bench miller and a multiple spindle drilling machine.

● FOR FASTER MOVING OF MATERIALS AND PARTS in process, the Continental-Diamond Fibre Co., 6 Chappell St., Newark, Delaware, have completely redesigned and recataloged their line of Diamond vulcanized fibre hollow ware. This redesign, according to the report, is based on greater standardization, but with sufficient flexibility so that standard equipment can be readily modified to efficiently meet any specific individual material handling problem, and still not penalize the buyer in the way of price for slight deviations from standard specifications. For example: usually a special box or truck of the same over-all dimensions will cost no more than one of standard specifications. The Diamond fibre hollow ware line is complete from lightweight tote boxes to heavy duty steel clad trucks. The new catalog just issued is a complete handbook on how to quickly and efficiently get things from here to there.

● "HOW TO MAINTAIN D-C MOTORS" IS THE TITLE of an informative bulletin recently issued by General Electric Co., Schenectady, N. Y., which contains a compact analysis of symptoms of motor troubles and suggests remedies to prevent failure and motor interruptions.

● SOUTH BEND LATHE WORKS, SOUTH BEND, INDIana, has issued a new complete general catalog which has 112 pages and contains over 240 illustrations. It shows 50 different sizes and types of South Bend back-geared, screw cutting lathes for manufacturing, tool room and general shop work.

● ATLANTIC GEAR WORKS, 204 LAFAYETTE ST., NEW York, has just issued its new 1941 general catalog on stock gears, sprockets and chains, reducers, bearings and couplings. Included are full specifications and prices of pinion rod, racks, ratchets, internal gears, special gears, spiral and helical gears, worm gears, bevel and miter gears and other products and full information regarding special services rendered by the company.

● A BULLETIN ON STANDARD BROACHING EQUIPment has been issued by Colonial Broach Co., 147 Jos. Campau St., Detroit, Michigan. Complete information such as capacity, speed of ram, principal measurements, electrical and shipping data is given for machines of various sizes. Close-up photographs illustrate special features.

● HOW THE NATION'S MACHINE TOOL INDUSTRY IS turning out lathes, milling machines, boring mills, planers and other types of machine tools for Uncle Sam's defense program at the rate of $650,000,000 a year, almost 4 times the production rate of the peak year of 1929, is told in a booklet entitled "Machine Tools" published by the National Machine Tool Builders' Association, Cleveland.

NATIONAL RESEARCH CREATES NEW PRODUCTS ★ NEW MARKETS

SAFETY *Speed* CONTROL

SETS ANY TOP SPEED WITHOUT LOSS OF POWER . . .
WORKS EFFICIENTLY . . . *thanks to*

NATIONAL VULCANIZED FIBRE — **PHENOLITE Laminated BAKELITE**

1. Phenolite Terminal Plate
2. Phenolite Rubbing Block Insulator
3. Phenolite Terminal Strip
4. National Fibre Insulating Liner
5. Phenolite Gear

THE Speed Control device shown above, which is readily attached to any pleasure car or truck, is manufactured by the Safety Speed Control Company of Chicago. This unit functions in a completely different manner from usual speed governors. It is operated by the speedometer cable — preserves the full power and acceleration of the car at all speeds below the set limit.

The dependable operation of the speed control unit relies to a great extent upon the important physical and electrical qualities of National Vulcanized Fibre and Phenolite, laminated Bakelite.

There may be a profitable use to which you can put National Vulcanized Fibre or Phenolite. Our technical men will be glad to work with you, without obligation, on the application of both of these products. We invite your inquiry.

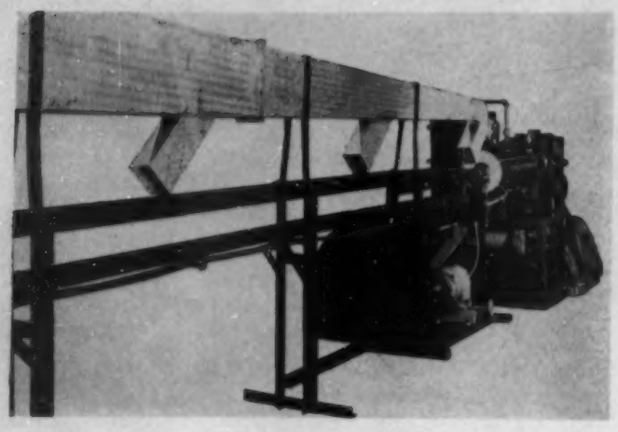
NATIONAL VULCANIZED FIBRE COMPANY

FOUNDED 1873

NATIONAL VULCANIZED FIBRE — WILMINGTON DELAWARE — PHENOLITE Laminated BAKELITE

These NATIONAL Products have a Cost-Cutting Application in your

Machinery and equipment



● NATIONAL RUBBER MACHINERY CO. HAS ANnounced an addition to its line of plastic extrusion or tubing machines. The new machine consists primarily of an improved extruder fitted with special cylinder and screw mechanism for the continuous extrusion of thermoplastic material and is complete with self-contained oil-heating and control mechanism, according to company reports. Also, there is a variable speed conveying and cooling unit for the extrusion of rods, tubes or miscellaneous shapes. The machine is so designed that raw granular materials can be readily fed into the feed hopper, and during the cycle of operation these materials are plasticized, and then forced through suitable die arranged for any desired shape or character of finished product.

The equipment is reported to be flexible—readily altered to accommodate numerous types of thermoplastics. The machine is also satisfactory for plastic-coated wire and for such operations the conventional type die is removed and replaced with a specially designed cross head, and a suitable automatic reeling or take-up mechanism replaces the conveying equipment. The photo above shows the front or operating side of the machine.

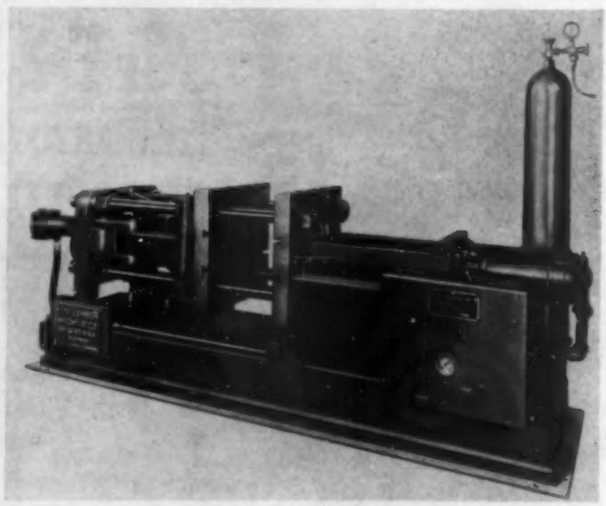
● DELTA MANUFACTURING CO. HAS ANNOUNCED two new surface plates, measuring 15 in. by 8 in. by 3 in. and 16 in. by 22 in. by 3 in. that provide a true surface to start with, a massive design and properly ribbed casting to insure the surface remaining true, ledges at the edges of the plate for clamping purposes, and edges that are square with each other and square with the face. These plates may be made into precision plates by simply scraping to a master plate or to each other.

● ROUND-TEX, A NEW TYPE OF ROUND BELTING IS being put on the market by Sudbury Laboratory, it is announced. Said to be useful wherever round belting is required, it is built on a tightly wound steel spring as a base and covered with 2 layers of rubber tire-tread stock separated by a layer of durable braid. It is installed with a slight tension, maintained by the steel spring core and requires no metal fasteners.

● DIAL-TYPE INDICATING THERMOMETERS MADE for a range from 30 deg. to 1000 deg. F. or its equivalent in Centigrade or Reaumur are announced by Foxboro Co. They are said to be readable at a distance of 20 ft. and to have a long distance range which allows the dial to be located at any convenient pump within 200 ft. of the sensitive bulb.

● LEIMAN BROTHERS, INC., ANNOUNCES A COMBInation suction blower and cyclone separator which pulls away dust from both the bottom and top areas surrounding a grinding or buffing wheel by means of a double intake connection. The dust-laden air is delivered into the separator unit for collection of the dust at the bottom and for air exhaust from the top. A dust drawer at the bottom of the assembly is removed and emptied at intervals. The equipment is available for one or two wheels or buffs to 24 in. in diameter according to the report.

● FLOOR TYPE GRINDING MACHINE WITH ILLUMInated wheels, is announced by Brown-Brockmeyer Co. The grinding wheels are mounted on the two ends of an enclosed motor. Starting and stopping is by means of pushbuttons at the front of the pedestal housing. The wheels are protected by adjustable guards equipped with exhaust connections, spark shields and integral in the shields is an electric light for each wheel, according to the report. Tool rests in front of the wheels, a tool tray and water pot complete the assembly.



● KUX-LOHNER MACHINE CO. ANNOUNCES ITS new high-pressure type die casting machine illustrated above, which will, it is claimed, produce die castings from either aluminum or brass alloys. These machines, built in 2 sizes, "HP-12" and "HP-18," are the hand-ladling type in which the molten metal is ladled by hand from a crucible into a well at the back of the stationary die half, and from there injected into the die under pressure of up to 10,000 lbs. per sq. in. Die space between the bars is 12 in. sq. on the smaller machine and 18 in. sq. on the larger machine. Castings up to 7 lbs. in brass and $2^1/_2$ lbs. in aluminum can be made under 10,000 lbs. per sq. in. injection pressure, it is said. Both machines are furnished fully hydraulic in operation, with the rams for opening and closing the dies.

● NEW SUB-BASE CONSTRUCTION, A 12 SPEED HEADstock, a universal or plain carriage with 24 in. of longitudinal travel and a hexagon turret with 12 in. of longitudinal travel are included in the assembly of an improved turret lathe made by W. K. Millholland Machy. The machine swings 20 in. over the ways and is available in three sizes for $1^3/_4$ in. 2 in., and $2^1/_2$ in. bar stock, according to the release. (*Please turn to next page*)

There's Money in Your Morgue!

F. L. VERNON General Manager

W. F. VERNON Sales Manager

Advertising Novelty Co

CALENDARS · NOVELTIES · SIGNS

Newton, Iowa

May 21, 1940

Stock Mold Department
Modern Plastics
Chanin Building
New York, New York

Gentlemen:

Will you kindly send us an up-to-date list of all your stock molds. If there is any charge for these, please bill us.

We have purchased from one of your customers, American Insulator Corporation, New Freedom, Pennsylvania, over 100,000 stove handles which were secured through your list of stock items. I thought this might be of interest to you.

Yours very truly,

ADVERTISING NOVELTY COMPANY

W F Vernon

Sales Manager

wfv/k

Look around your mold morgue, Mr. Molder.

Have you any molds for stock or standard items such as ash trays, stove handles, boxes, or anything that can be adapted to the uses of various manufacturers?

Modern Plastics will present your stock moldings to an audience of important plastics users. The letter reproduced is only one of many which attest to thousands of dollars worth of plastics buying done directly through Modern Plastics' Stock Mold Sheets.

Send your items for display without cost or obligation to

STOCK MOLD DEPARTMENT

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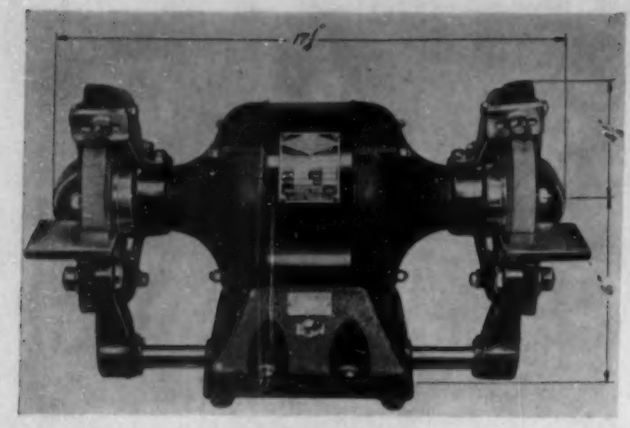


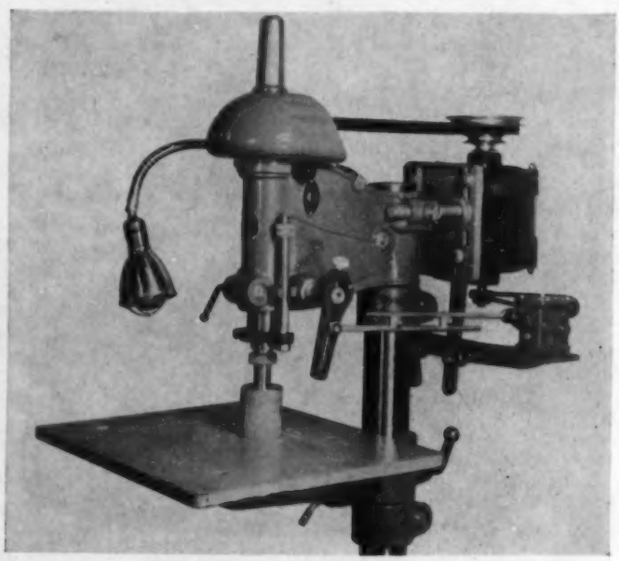
● INDEPENDENT PNEUMATIC TOOL CO. ANNOUNCES an improved bench-type grinding machine unit pictured above. Available in three sizes with reference to the motor, between 1/4 and 1/2 hp., the smallest and the intermediate size to take 6 in. wheels, the largest for 7 in. wheels. Motor is enclosed ball-bearing design with sealed bearings. Assembly includes adjustable tool rests and wheel guards.

● RECENTLY IMPROVED, THE FRAY ALL-ANGLE milling machine mounts a 7 1/2 in. by 29 in. table under a spindle having a 3 1/2 in. travel. This spindle is carried in a head that can be rotated around two horizontal axes lying at 90 deg. with each other and around a vertical axis, we are told. It also can be moved laterally through a distance of 12 in. over a slide fitted with a lead screw or positioned at any point through a 10 in. movement along its mounting on a circular overarm. It is claimed to perform all milling, boring, drilling and grinding operations in the horizontal and vertical planes, and also angular operations without changing the work set-up.

● PARAMOUNT PRODUCTS CO. REPORTS THAT THE Whiz, all purpose, electric tool is flexible enough for heavy power jobs and handy for delicate precision work. Weighing less than 3 1/2 lbs. the machine is claimed sturdy enough for tough drilling or grinding, yet can be operated with one hand, holding a pistol grip handle. Size is 7 5/8 in. by 6 in. and it comes complete with chuck, rubber cord and plug for use on AC or DC current. Complete accessories for carving plastics, wood, etc., sawing, shaping metals, polishing, sanding, sharpening and etching are available. The device is pictured above.

● A NEW, LOW-PRICED DRAFTING MACHINE, DESIGNated as the Model No. 60, reported to take a maximum size sheet 24 by 36 in. has been annunced by the Drafto Co. It is light in weight for ease of operation, and its arms are constructed of seamless steel tubing, fitted with solid bearings. The scale blades are designed so that any scale, either boxwood or aluminum, can be inserted. An outstanding feature of this drafting machine is that its stainless steel protractor plate is graduated in 2 degrees, and can be set accurately for 1/2 degree readings by use of the graduated vernier.

● TO SPEED SHOP PRODUCTION, TO PREVENT TIE-ups of regular tool grinders, Roan Mfg. Co. has announced the new Roan end mill grinding fixture. This compact device, weighing only 8 lbs. and measuring no more than 5 by 7 in., will, the manufacturer asserts, grind an end mill in 5 min.—as compared with perhaps 30 min. The grinding wheel slips into the chuck of any high-speed drill press—converting it into a tool grinder at small cost. The fixture, which takes single or double end mills, straight or tapered shanks, right or left-hand, grinds mills up to one inch shank diameter, is equipped with a precision-made arbor that fits a 3/8-in. capacity drill press chuck.



● RECIPROC OSCILLATING MECHANISM, RECENTLY developed by Specialty Machinery Co., is claimed to place any standard drill press into a completely different dimension of mechanical ingeniousness (as shown above). Used in sanding, it is said to provide the sanding drum with longitudinal motion necessary for smooth finish on plastics, wood or metal. According to the report, it can be used to form an oscillating die grinder, as a lapper for close fit holes with expansion laps, for mixing stiff liquids with a mixing stick in drill chuck, for edge jointing and planing of boards of limited width.

● DESIGNED TO PRODUCE PRECISION SECOND OPERation, work such as finishing or sizing, at high speeds the Hardinge high speed second operation work machine is said to have many features advantageous for high speed precision production work. Some of these are: enclosed head with preloaded ball bearing spindle construction, electrical driving unit with multi-speed motor, eliminating all gears, clutches and loose pulleys which are expensive and cause objectionable noise and vibration, convenient lever speed control at the headstock of the machine and the modern welded, all steel pedestal and a brake for rapidly stopping spindle, to increase toolroom production.

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A date with Universal will prove that perfect molding and fine finishing can be secured at economical cost.
We're proud of this calendar; we're proud of all of the work we've done, from base plugs to lipsticks, from toy soldiers to radio cabinets.
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Maine offers much to manufacturers who are rushed with defense orders or moving, expanding or decentralizing. No State income tax, no sales tax, no machinery tax, no corporation tax. Complete details of this plant furnished on request. There are a few other plants ready for occupancy, and many desirable business sites available. State the requirements of your business. Address: Maine Development Commission, Room 531, State House, Augusta, Maine.
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In the limelight

● TWO TECHNICAL SYMPOSIUMS, ONE ON COLOR—its specification and use in evaluating the Appearance of Materials, and the second on New Methods for Particle Size Determinations in the Subsieve Range featured three sessions of the Spring Meeting of the American Society for Testing Materials held at The Mayflower, Washington, D. C., March 4 and 5.

● H. J. WILLIAMS WHO WAS FORMERLY ASSOCIATED with Durez Plastics & Chemicals, Inc., and Index Machinery Corp., reports he has taken over the American distribution of a self-contained steam heated heating cylinder for all types of injection molding machines. The heating cylinder was developed by A. A. Burry of Toronto, Canada. Mr. Williams maintains his residence and office at Stoughton, Mass.

● THE PLASTIC PRODUCTS MANUFACTURERS ASSOciation, New York, held a testimonial dinner January 24, in honor of its president, Oscar Gold, of Ortho Plastic Novelties, Inc. The Association was organized less than four years ago among plastic firms in the New York Metropolitan area for mutual interest. Officers are Wm. Ballot, Reuben Voichick, vice presidents, Moe Zweibel, treasurer, A. D. Seideman, secretary, and A. Edelman, executive director.

● SCHNER-BLOCK CO., MOLDED PLASTIC DIVISION, reports it has set up an organization in New York at 386 Fourth Ave., to act as sales representatives of the custom molding division of Auburn Button Works, Inc., Auburn, N. Y. In addition the company has an industrial design department.

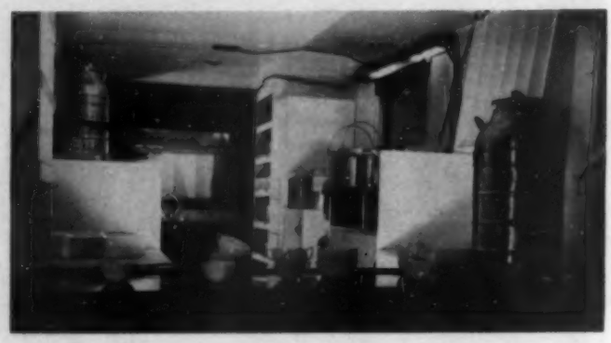
● WILLIAM G. STEINER, FOR 20 YEARS IN CHARGE of sales promotion and advertising for Formica Insulation Co., Cincinnati, has joined Chester Moreland Co., advertising agency in that city where he will continue to handle the company's account. J. Roger White, for 12 years manager of the Formica sales branch in New York has been appointed sales manager for the company.

● "CHEMURGY IN DEFENSE—AND BEYOND" WILL be the theme for the Seventh Annual Conference of the National Farm Chemurgic Council, to be held in Chicago, March 26–28. The conference will be opened by Mr. Wheeler McMillen, president of the Council, at the Wednesday noon luncheon, and each following session will be devoted to the discussion of various chemurgic developments. The first evening session, on Wednesday, in accordance with the former conferences, will include the "Symposium on New Developments."

● HARRY W. HAHN, WHO STARTED PLASTICS & DIE Cast Products Corp. as Harry W. Hahn Mfg. Co. in 1920 and who was its president until the close of 1938 when he left to join the Shaw Insulator Co. as research director in Transfer Molding and who later became their General Manager, resigned January 1, 1941, he informs us. He has returned to Los Angeles as president of his old company.

● AN ILLUSTRATED LECTURE ENTITLED "PIONEERing in Plastics" was presented by Mrs. Cora Scovil, president of Vasah, Inc., at the Decorators Club on February 17th. Alfred Egerter, Plaskon Co., spoke briefly on some of the technical aspects of the materials, while Mrs. Scovil discussed her plastic efforts along decorative lines.

● WITH PLASTICS IN THE PUBLIC EYE MORE THAN ever because of recent defense problems, university, business and professional groups throughout the country have sponsored special discussions on plastics with "The Magic of Modern Plastics," our 16 mm. sound and color film as the highlight of the meetings, along with prominent speakers. On February 18, the Cleveland Engineering Society presented a general meeting at the Statler Hotel in Cleveland, Ohio, which was attended by over 300 guests. William T. Cruse, editor of MODERN PLASTICS, was the principal speaker accompanying his lecture with a display of samples of plastic items and raw materials supplied by the industry. On February 25, the Business and Marketing Clinic of the University of Baltimore, Md., presented a session on "Marketing Plastics—An Amazing New Industry," at which Mr. Cruse lectured. On February 28, the Detroit Rubber and Plastic Group conducted a program on plastics at the Hotel Whittier. Gordon Brown, Bakelite Corp., spoke on "Evaluating the Moldable Plastics," after which the film was shown.



● LINED UP ON THE SERVING COUNTER OF A mobile feeding unit (above) are dishes of molded Beetle. Hot food and drinks are provided through these units to bombed civilians, evacuees, firemen, air-raid wardens and other divisions in England. A partial view of the interior of one of these units shows insulated containers, cooking utensils and storage facilities. The demand is great for these mobile kitchens and the British War Relief Society, Inc., is sending over units that are American designed and built. The urea dishes are, washable, lightweight and easy to handle; they are molded by Northern Industrial Chemical Company.

● THE CHICAGO SOCIETY OF INDUSTRIAL DEsigners announces a competition for the members of the profession, designers, draftsmen and students to create an interest in the service the Industrial Designers are rendering to industry, to encourage draftsmen and students and to increase an awareness of good design and civic development. The subject of this competition shall be the design of a "Traffic Control Light," such as is used at many of the major intersections of this city. Restrictions and requirements for submission may be obtained from Anne Swainson, competition director. All entries must be submitted by Friday, March 28, 1941.

● THE DATES FOR BOTH THE SPRING AND FALL meetings of the Association of National Advertisers, New York, have been announced by H. W. Roden, Chairman of the Board of that organization. The spring meeting will be held at the Westchester Country Club, Rye, N. Y., on May 14–17, 1941. The fall, or annual meeting, will be held at The Homestead, Hot Springs, Virginia, on October 22–25, 1941.

(*Please turn to next page*)

They'll Suggest the Most Accurate and Economical Way to Produce Your Injection Moldings

SINKO engineers have an enviable record of accomplishment. For they have and are currently solving some of injection molding's most difficult problems. Moldings considered impossible to successfully produce by this speedier, more economical method have been completed speedily, efficiently and with unerring accuracy.

However simple or involved your molding problem, we believe you'll benefit by using SINKO Precision Injection Molding Service. Many of America's largest users of plastic moldings depend upon us for their needs. Your request for advice, suggestions, and moderate cost estimates does not obligate you at all. May we look forward to serving you soon.

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City _____ State _____

● WITH PLEASURE, WE CAN REPORT THAT REGULAR issue of *British Plastics*, the journal of our English contemporaries, continues to reach us. While "doing business at the same old stand" may not be the order of the day regardless business does go on in the same old way. We are not impressed by this fact alone. We have always respected the makeup of the magazine. We still do. Today in addition we admire the individuals and the systems which under horrifying war conditions permits the regular publication of the magazine without any noticeable change.

The editorial contents maintain their high standard. Now in addition they carry an added message. By reporting the developments and progress of *British Plastics* they show how that industry in spite of war is continuing to serve its established customers, how it is assuming the additional responsibility of supplying products for war demands and how, in face of odds, research as evidenced by new products and new processes is being continued.

Yes, they are occupied with a grim program. Their wares don't belie that fact. They are apparently the product of a normal economy. It is a splendid tribute to human fortitude. If we didn't know, it would be "Business as usual."

● A NEW PASTE, ESPECIALLY DESIGNED FOR FASTening paper labels, Government strip stamps, etc., to lithographed, lacquered or varnished metal caps, surfaces, corks and plastics has been announced by Paisley Products, Inc., 1770 Canalport Ave., Chicago, and 630 W. 51st Street, New York. It is claimed this new paste employs a new principle of action and the manufacturer further states this product has been approved for use with cellulose bands as it has no injurious effect on such materials. Supplied in concentrated form, the paste can be used, as received or diluted with water, by either hand application or gumming machine. It is non-staining, non-corrosive and permanently holds without crystallizing or peeling off even under severe handling or climatic conditions, the manufacturer says.

FLEXIBLE, HIGH LUSTROUS FINISHES ON RUBBER synthetics and fabrics are said to be easily obtainable by means of Hevealac, recently introduced by the Glyco Products Co., Inc., 148 Lafayette St., New York.

According to a release from the company, Hevealac is a compounded resin solution in alcohol, which dries rapidly, giving a clear, transparent film characterized by high elasticity and gloss. It can be applied by brushing, dipping or spraying. Hevealac films are said to be practically non-inflammable when dry, to adhere strongly to most surfaces, retain flexibility at low temperatures, and unaffected by water, oils, etc.

● GOODYEAR TIRE AND RUBBER CO. HELD AN EXhibition at the Waldorf-Astoria Hotel, New York, N. Y., on January 22, 1941, to display the numerous ways in which it is assisting the government in the emergency defense program. Mr. P. W. Litchfield, Chairman of the Board of the company addressed the guests explaining how his company was prepared to serve and he reviewed the far reaching effect the war in Europe had had on their foreign operations. He also briefly outlined his company's development of synthetic rubber, intended as steps toward making the U. S. less reliant on important natural rubber.

● F. S. HUBBELL FORMERLY SALES PROMOTION Manager for Seagrams and Schenley and S. Radus formerly with Universal Plastics are now located with Consolidated Molded Products Corp. at 1776 B'dway, New York, the company reports.

● NATIONAL INDUSTRIAL ADVERTISERS ASSOCIAtion will hold its 19th annual conference, in September, in Toronto, according to a statement released by Richard P. Dodds, president of the Association.

● CELLULOID CORP. REPORTS THAT ITS CALIFORNIA representative, Gardiner Agencies, has moved to 1351 South Olive St., Los Angeles.

● WITH THE MOVEMENT OF PERSONNEL AND equipment now completed, Chicago district activities of the General Electric Co. and affiliated companies, formerly scattered in nine separate locations, are now housed in G.E.'s new $1,500,000 building in Chicago, which occupies an entire city block. Directed from these new regional headquarters are the sales, engineering, and servicing operations in 11 midwestern states and parts of three others, including offices at Davenport, Detroit, Kansas City, Milwaukee, Minneapolis, Omaha, and St. Louis.

● REICHARD-COULSTON, INC., DRY COLORS, REPORT the removal of their offices to 15 East 26th St., New York. Telephone: Murray Hill 5-2166.

● FREDERICK C. RENNER, ASSISTANT MANAGER OF the New York branch of Monsanto Chemical Co., has been promoted to the position of assistant manager of sales of the company's Organic Chemicals division, with headquarters in St. Louis, Missouri. Clare F. Trombley will succeed Mr. Renner.

● HAMMERTONE FINISHES RESEMBLING HAMmered silver, copper, bronze, and other ornamental metals applicable to metal and plastics products have been recently developed by Maas & Waldstein Co., Newark, N. J.

● ROBINSON MFG. CO. ANNOUNCES THAT A NEW sales and service office will be established in the Commercial Trust Bldg., Philadelphia, Pa., with R. V. Schneider in charge.

● SULFATATE, NEW WETTING AGENT, MANUFACtured by Glyco Products Co., Inc., 148 Lafayette St., New York, is said to eliminate *creep* of water colors and inaccuracy of design on high polished acetate sheet surfaces. The water soluble dye is dissolved in a special solution which, it is claimed, will not increase viscosity, nor affect opacity and color intensity.

● CHAS. J. WESTIN, CHIEF DESIGN ENGINEER FOR the F. J. Stokes Machine Co., died at his home in Philadelphia, January 29.

Mr. Westin was born in Sweden and had been designing engineer for the company since January 1928, prior to which he was a member of the government engineering staff at the Picatinny Arsenal. He was a prolific inventor—his Westite Hermetic tube closure made it possible to close a collapsible tube with an airtight and leak-proof seal that is now widely used in packaging. His other inventions include the development of automatic plastic molding equipment and tablet compressing machines for industrial service.

● BECAUSE OF THE MANY REQUESTS FROM FRIENDS and admirers of Carleton Ellis who passed away on January 13, 1941, as to whether or not the laboratories were to continue, we have learned that the laboratories are so set up that they will definitely continue in business as a consulting research laboratory. They are located at 98 Greenwood Avenue, Montclair, N. J., under the direction of Bertram Ellis, his son; Carleton Ellis, Jr., another son, is at the present time, located in Toledo, Ohio, with the Plaskon Company.

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PHENOL FORMALDEHYDE CAST

Bakelite, Catalin, Gemstone, Marblette, Monsanto CP

UREA FORMALDEHYDE MOLDING

Bakelite, Beetle, Plaskon

ACRYLATE & METHACRYLATE

Crystalite, Lucite, Plexiglas

STYRENE

Bakelite, Styron

HARD RUBBER

Ace, Luzerne, Rub-Tex

CASEIN

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ETHYLCELLULOSE

Ethocel

CELLULOSE ACETATE

Bakelite, Lumarith, Masuron, Monsanto CA, Tenite, Nixonite, Plastacele

CELLULOSE ACETATE BUTYRATE

Tenite II

CELLULOSE NITRATE (Pyroxylin)

Celluloid, Monsanto CN, Nixonoid, Pyralin, Soy Bean

The above information is indicative of the extensive research work we have carried on in the past few years in adapting this widely used compound—LEAROK—to plastics. We suggest that you send us samples of your work with an outline of what you wish to have done. Our technical men will recommend the grade of LEAROK which should reduce your costs of cutting and buffing.

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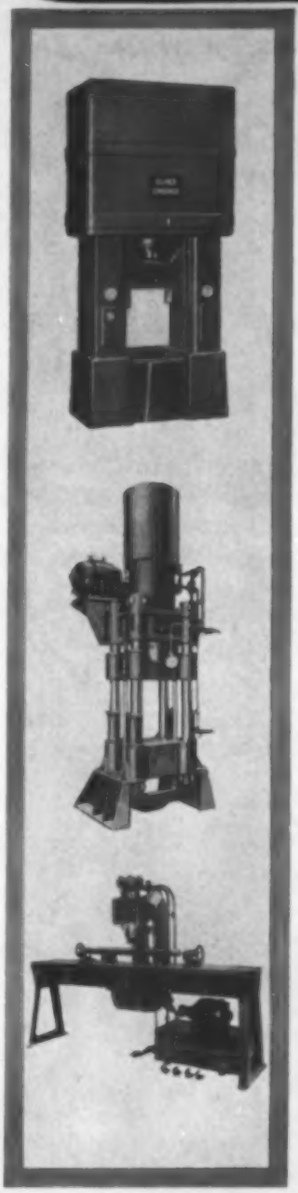

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Plastics mark time

(*Continued from page 34*) From an acoustical standpoint, they have everything to offer. This is one of the reasons why the plastic encased door chime has represented such a real advance over the wooden or metal-housed unit. In the matter of appearance, the possibilities in this connection are really just being appreciated by the industry.

This is a point which issues a challenge to imaginative design and industrial daring. As modern interiors become more functional and expressive of the age in which we live, rather than reminiscent of yesterday, the substances of today will come into their own and no longer will we seek to reproduce in modern materials the forms and shapes and styles copied from and belonging to time past.

While the clock case at this time is still the paramount application (as far as volume of plastic material is concerned) for which plastics are being used in this industry, the urea plastics have been found to be suitable for the dials of clocks where illumination from the inside of the unit is incorporated, and where their high degree of translucency combined with rigidity under varying temperatures suggests these materials. Translucent plastic clock faces or dials are being used more and more widely, and the fact that the numerals may be incorporated in the mold itself and thus impressed upon the face as the dial is being made, eliminates a costly operation ranging from tedious engraving in the more expensive clocks to a printing, transfer or other similar process in cheaper ones. The ease of cleaning, permanence of tone and finish of such dials again become an important consideration as well as the ability of the translucent forms of urea to diffuse light evenly without so-called "hot spots" or "filament fire" and with the utmost minimum of glare.

Urea plastics, because of their dimensional stability and the closer tolerances to which moldings from them may be held, are being utilized for forming the numeral drums of the direct-reading or "cyclometer" type of clock now making a full-fledged appearance on the market. Not only do the plastic drums outlast the metal ones, but they are far quieter in their operation, turn more silently without giving off any metallic click, and their looks will practically never be dulled by tarnish, yellowed with age or made unsightly by surface abrasion. These drums are turned in advanced models by plastic gears molded integrally with the drum itself, an obvious production advantage from the manufacturer's standpoint. Quite beyond being just a novelty, these gears require no lubricant to accumulate grimy abrasive dust, which increases wear and the need for periodic removal. Therefore, such clocks avoid this—their own form of silicosis—and its attendant shortening of their life expectancy!

The use of plastics by the clock industry is as fine an endorsement as a material could receive. First of all, the fact that most of the major companies have been in business many years, some for centuries, has vested them with a fundamental conservatism in all their policies. Further, it is natural that this conservatism would be magnified when the nature of their business is considered. People do not buy a clock as they purchase a hat, a suit, a radio, or even an automobile. Money spent for a clock is considered a permanent

15—A stage in the assembly of a plastic clock—the extension cord is being inserted through a hole drilled in the wall of the clock case. **16**—A view in one of the workrooms where various operations in the assembly of the clock's motor are carried on

15

16

PHOTOS, COURTESY WARREN TELECHRON CO.

TIME MARCHES... on Plastics

Plastic milestones record the march of industry today. In every field of endeavor science turns inevitably to plastics as the medium best suited to many needs of modern engineering design. In every field manufacturers turn to Kurz-Kasch for the solution to plastic molding problems. They look to K-K for skill, experience, ability and facilities to mold plastics into any shape, in any quantity. Why not discuss your molding problems with Kurz-Kasch engineers? There is no obligation.

Time marches, encased by beautiful Bakelite and Ivory Plaskon and Beetle in the attractive modern Shelby Clock, molded for Westclox by Kurz-Kasch.

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"Manufacturers of Laminated Plastics Since 1911" — NEWARK • DELAWARE

17

18

19

PHOTOS. COURTESY NORTHERN INDUSTRIAL CHEMICAL CO.

Various stages in the production of plastic clock case—**17**—A hole is drilled in the side wall of a clock case. Precision template assures accuracy of location. **18**—Here the clock case is being removed from the mold. **19**—Buff polishing of molded clock cases removes all rough parts and smooths hidden surfaces. Since clocks are among man's foremost precision instruments, in adapting plastics for their housings, every manufacturing step is carefully handled and controlled

capital investment. Clocks are really not classed as consumers' goods. For an established industry, so fully aware of these considerations, and which might readily view innovations skeptically or even with prejudice, to have adopted such a new material for their production requirements speaks eloquently for that material. The acceptance here of plastics is even more noteworthy when a thought is given to the very substantial investment which many clock producers had already made in woodworking machinery and equipment. Not fully aware of the various properties of plastics, early in the transitional stage from wood and metal to plastics, many designers unfamiliar with them specified these materials as an out-and-out substitute for wood or metal. In other words, they designed a wood clock case and specified that it be executed in plastic. Nothing could have been more dangerous for the plastics industry had this practice been allowed to continue. Unfortunately, this was a condition which has prevailed in other industries wherein plastics were making their debut, and the fact that it is happily on the wane at present is testimony to the perseverance of all connected with plastics who have done such a vigorous and cooperative job in combating what might have been infanticide. This tendency was recognized and adroitly corrected in the clock industry as elsewhere by making available to manufacturers, even under pressure, every whit of information pertaining to the material properties as it emerged from the laboratory. What developed to be rules as time went on about proper plastic designs, and other pertinent data, were passed along also.

Seth Thomas, one of the oldest manufacturers of quality clocks in this country, uses plastics widely for wall and casual clocks and for the housings on its stove-timers. The Westclox Co. has also been a leader in using well-designed plastic cases. The Warren Telechron Co., the largest maker of electrical clocks, has found that plastic cases are exceptionally good for wall clocks because of the lightness of the material and because they may be easily cleaned. Being almost a permanent fixture, the durability and non-chipping character of the plastic case serves to make it particularly suitable for wall clocks.

Another major manufacturer, New Haven Co., uses plastics in a diversified way. Ivory ureas and dark phenolics have been employed for both inexpensive and expensive alarm clocks in this line and also many novelty models with interesting features have been introduced. One of the most recent of these is a small desk clock with two sliding flexible panels. These panels may be pulled over to cover the back of the clock where the winding bezels are located and also the face of the clock. As the clock is one that has been designed for use in traveling, these panels provide excellent protection against breakage in suitcases.

Pennwood, Lux, Hammond, Waterbury, Gilbert, Sessions and others have extended their lines with plastic models. Since the first plastic clock appeared, the number of models subsequently produced has gone into

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many scores. The Warren Telechron Co. alone has introduced during this period over fifty new models. Recurring new designs and models are not developed in copious quantities by any member of the clock industry because of the inherent desire of the industry to stabilize its product and sell it on the basis of its accuracy, good taste and quality rather than on the superficial foundation of unwarranted variety. As a result, there is mass production of fewer but more successfully planned designs. Viewed in this light, the number of plastic types that have appeared on the market speaks volumes.

Credits: 1—New Haven Clock Co.; Plaskon cases. 2—Hammond Clock Co.; Beetle housing. 3—H. A. Adams Co.; made by Simplex Button Co., Celluloid halo. 4—Molded by Ebner E. Mills Corp. for Middlebury Clock Co. 5—New Haven clock with Catalin case. 6—Traveling model left is Beetle and Shelby model, right, molded of Beetle, Bakelite and Plaskon by Kurz-Kasch, Inc., for Westclox. 7—Moderne Numechron model of Durez and Tenite, designed by Peter Muller-Munk for the Pennwood Co. 8—Opalon case, Warren Telechron Co. 9—Kitchen clock molded of Textolite by Plastics Dept., General Electric Co. 10—G-E clocks molded of Crystalite by Plastics Dept., General Electric Co. 11—Spider Web clock designed by Accessory Timepieces of Lucite with Formica. 12—Molded of Bakelite phenolic by Waterbury Button Co. for face De Luxe Clock & Mfg. Co. 13—Petite Numechron designed by Peter Muller-Munk for the Pennwood Co. of Bakelite. 14—Housing of Marblette.

Sundial, Sandglass, and Anne Boleyn antique clock, are from "Old Clocks and Watches and Their Makers" by F. J. Britten, E. & F. N. Spon, Ltd. (New York Public Library).

One-shot radio housing

(***Continued from page 44***) a total of 11 holes and slots were called for. End to end or parallel "shooting" was impossible because of the position of the openings—in fact, the only manner possible to "shoot" was from the end and side combined. As no change in design was permissible, the final decision was to place the cover at right angles to the base.

The difficulties encountered with this type of arrangement arise from the fact that the cover, with a total area of 45 sq. in., and weighing only 3 oz. was opposed by the much larger box with a total area of 76¾ sq. in. and 5 oz. in weight. The areas and weights alone loomed up as obstacles but, in addition, it was necessary to provide space for the intricate workings and movements of the shafts, pinions, racks and pins for side coring.

Considering the fact that a total of 11 openings plus the mechanism involved already taxed the platen area to the utmost, there was no further space to utilize the stroke of the press to move the cores. A manually operated set of cams would also have been objectionable because of the forces required and the possibility of error on the part of the operator. Failure of the operator to draw the cores before the press opened would prove disastrous.

To overcome these conditions, it was decided to install an air-operated cylinder that moved the rack

2

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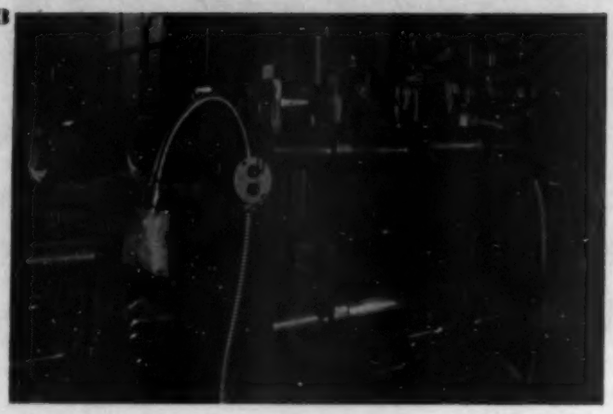
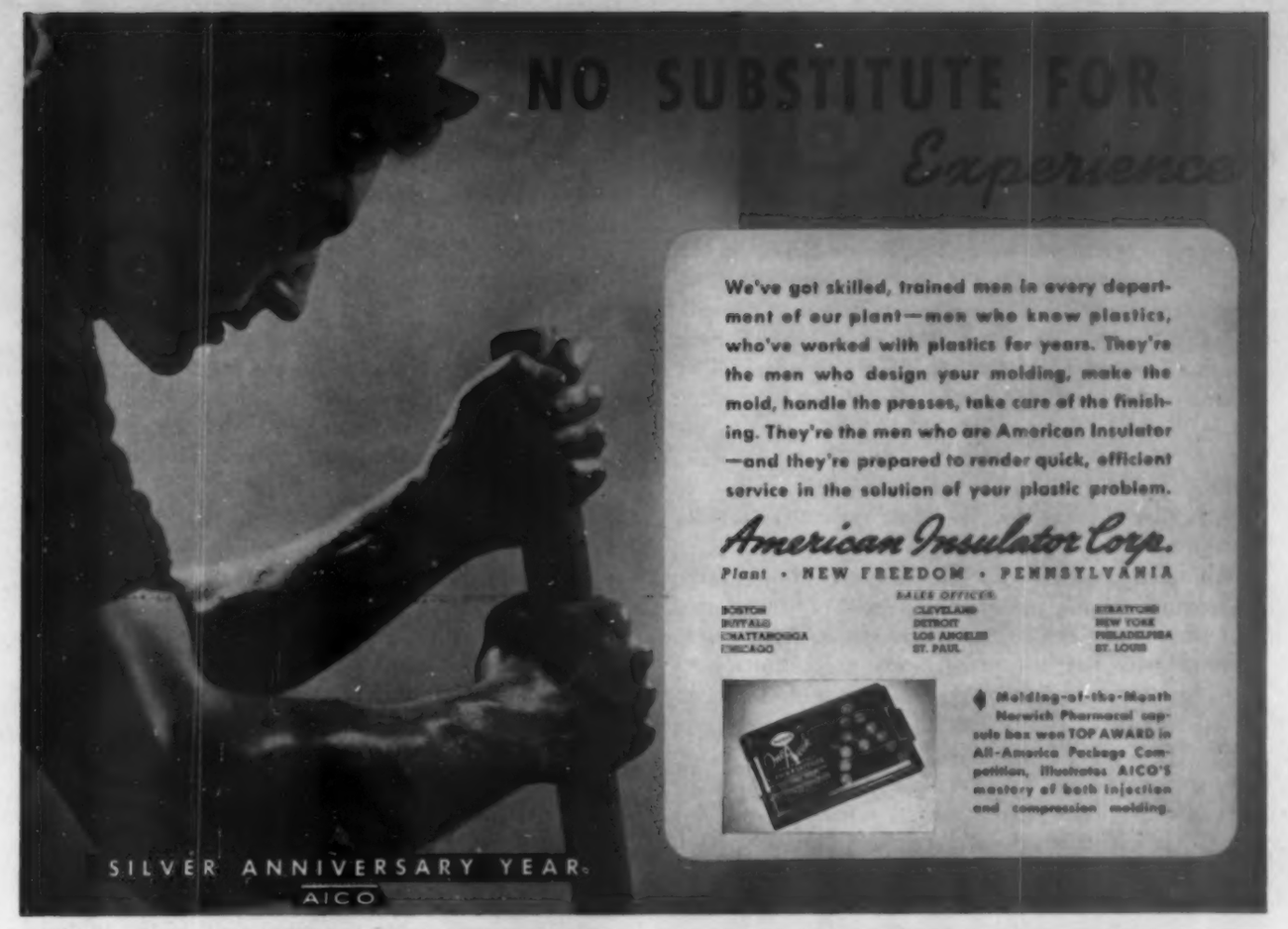


2—The box and cover of the radio on the single sprue just as they come from the mold show the right-angle placement of the two unequally sized parts. 3—View of the complete mold in position on the press including upper section and compressed air cylinder installation

which engaged a shaft through a pinion, and again transferred the movement to a combination rack and cam. The element of operator failure was eliminated by tying up the valve on the air cylinder with a solenoid switch which was synchronized to the movements of the press, thereby resulting in a complete automatic cycle. Fig. 3 illustrates these details of mold construction including the position and method of mounting the compressed air cylinder. The tool required for this job covered an area of 16 in. by 28 in. and weighed well over 1000 pounds.

Accurate study and planning during the drawing board stage was absolutely essential since an extremely short time limit was imposed on the molder and there was little opportunity for experimentation. Failure anywhere along the line would have caused considerable loss to both molder and customer.

Credits: Tenite, II, Molded by Sinko Tool & Mfg. Co. Injection press by Hydraulic Press Mfg. Corp. Built by Colonial Radio Corp. for General Motors.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Illustrated above is a 3180 Ton Hydraulic Precision Belt Press. The 24 Meehanite press rams as well as stretcher rams are chromium plated and polished to prolong packing life. Steam plates, size 66" x 30'-0", have polished working surfaces. Clamp and belt stretcher with 42" stroke have 60 tons capacity.

HYDRAULIC PRESSES AND VALVES FOR EVERY PURPOSE

Molding resin-treated paper

(*Continued from page 39*) weight for weight, can never equal that of continuous laminations, because when the laminations are *not* continuous, small lakes of pure resin are formed in the finished molded piece. These pure resin lakes are apt to be weak links in the chain and, sometimes, result in poor appearance or finish for decorative surfaces. True laminated structures with compound shapes comparable to those obtained from molding powders heretofore could only be acquired by machining blocks of laminated plastics, or by cutting out segments from flat sheets before forming, or by deliberately macerating in certain areas. All of these methods result either in slow, costly operations or pieces with weakened areas that are no stronger than articles made from some of the molding powders. Still another attempt to bridge the gap has been made through the development of pulp preforms. The adaptation of pulp preforms is somewhat limited, however, because, in common with flat, saturated laminations, the charge does not possess the one essential property for compound shapes of uneven wall thickness, namely, the ability to flow within the mold!

In an effort to find a means of meeting the conditions of moldability plus great strength, a material was developed which is fundamentally a sheet of paper associated or impregnated with synthetic resin and which has been gathered in both diagonals under a patented process so as to impart to the sheet stretchability in all directions. This all-directional stretch gives the material two properties, that of draw in somewhat the same sense that metals possess the property of draw, and also flow, that is, flow within the mold. In the case of this resin-impregnated x-creped paper the flow will be away from an area of high pressure and toward one of lower pressure, thus making possible unequal wall sections in the molding, without rupturing any of the continuous laminations because its flow or draw is merely an unfolding of the gatherings or crepes, which does not distort or weaken the fibrous structure. The flow properties of resin-treated x-creped paper within the mold are very similar to those of impact molding powders and are reported to be in excess of other continuous laminated webs, resin-treated boards or pulp preforms.

The diagrams on page 39 graphically indicate these flow properties of the x-creped paper within the mold. Fig. 2 (before closing mold) and Fig. 3 (after closing mold) show the flow or movement that takes place in a charge of resin treated x-creped sheets, in a mold having non-uniform wall thickness. As the mold closes the pressure is at first concentrated at the high pressure areas (HP), thereby causing the x-creped material to flow into the low pressure area (LP) until the pressure is equalized as in Fig. 3. The size of the creping configurations is greatly exaggerated in this drawing in order to demonstrate the movement of the material during the molding operation.

It should be noted that in Fig. 3 the creping gatherings have been partially removed by unfolding in the areas away from which the movement or flow has radiated, but that the gatherings are intensified by being crowded together in the areas towards which the movement was directed without disturbing the relationship or the interlocking of the paper fibers themselves. This preservation of the fibrous structure of the paper together with the continuity of the laminations accounts for the remarkable strength of pieces molded from this resin-treated x-creped material.

For some years, a leading paper manufacturer has been imparting all-directional stretch to webs by an adhesive creping method which it developed and patented. The company first produced waterproofed, paperlined, burlap bags, the paper lining possessing all-directional stretch to permit weaving with the fabric without rupturing. This process was carried over into an imitation leather line where the universal stretchability permitted embossing with deep grains and it is now being adapted to the plastics field.

Many unusual, unexpected properties have been discovered by company tests during the development work that were not obvious when the idea was first conceived, with the result that quite a number of revolutionary ideas are being established. The material can be prepared to adapt itself to the technique of custom molders or it can be processed to lend itself to the saturating technique of established laminators. The company

These pieces are all experimentally molded from the resin-treated x-creped paper sheets. The large bucket shows how the material welds and indicates its deep drawing possibilities. Three typical small parts suggest its suitability for such contour

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Eliminate Inserts and Tapping!

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Thread-Cutting Screws

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That's All!

Specially designed for PLASTICS!

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See for yourself how these screws work. Try them in any type or thickness of plastic material—molded or laminated sections. Write today, stating the type desired—testing samples will be forwarded immediately!

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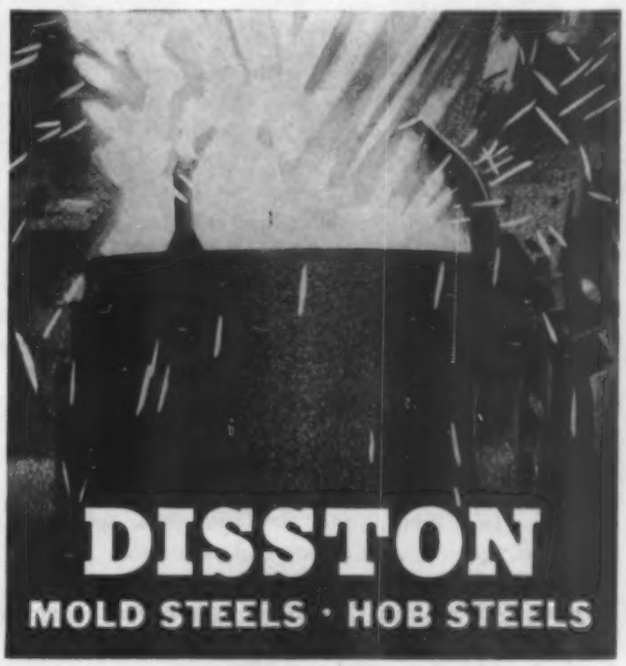
Four special Disston Steels . . . carefully manufactured in modern electric furnaces to meet the most exacting requirements of plastic molding . . . will help you to reduce your percentage of rejects and to speed up your output.

Whether you make molds and hobs, or use them, you'll find that it pays to specify Disston Steel of the right grade . . . steel that's uniformly sound, with no hard spots or spongy areas.



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does not propose to process finished articles from their material. It is their intent to develop their process, selling a prepared web in various forms to the molders and the laminators in order to reach the entire plastics field. The resin content of the web can be varied almost at will although there are technical points involved that can best be handled in specific cases. No attempt has been made to date to establish tables recording the physical properties of the material. One reason for this is that those properties can be varied or changed within a wide range, depending upon the type of material used in the web itself, the type of resin and the amount of resin added to the web, the combinations used in making up the finished charge and even the size and shape of the piece to be molded. Generally speaking, the strength of any piece molded from the material should be approximately that of good quality flat laminated stock of equal weight and resin content. One of the outstanding properties, as pointed out, of the resin-impregnated x-creped paper is the strength that an article formed from it would have. It would be higher than an article molded from phenolic powder with fillers, tests have shown.

Because the material can accommodate and adjust itself by flowing within the mold in addition to having the property of draw, large objects requiring compound curves can be molded therefrom. Because of the high strength factor, wall sections and weights can be reduced, thus effecting economies. It will permit the molding-in of inserts and bosses, lending itself therefore to machine parts and housing, and its flow properties will permit it to fill in tightly around inserts without resin segregation. Because of its great strength, drilling and tapping are possible and sometimes preferable.

With the ability of this resin-impregnated x-creped material to adapt itself to uneven thicknesses it can readily be overlapped or spliced within the mold for extremely large pieces where the size of the sheet might otherwise be a limiting factor. Overlaps or splices of this kind, therefore, are strong and practical.

High finishes comparable to other laminated structures we find are obtainable and the moisture resistant qualities can be made at least equal to conventional laminated structures and sometimes superior, because the material will permit itself to be pinched off around the edges of the mold, thus giving molded edges instead of cut edges, which are common with most laminated structures. The material can be used in either open type molds, flash type molds or positive type molds, the technique of preparing the charge varying slightly with the type of mold used. The resin-impregnated x-creped paper may be an alternate for applications of metals. Its low specific gravity will lighten the weight of the finished piece and because of its great strength the thickness of the wall section will not be considerably affected. Much finishing such as machining, painting and enameling will be eliminated.

Because it is a new material development, this resin-impregnated x-creped paper allows an unlimited range for the imagination of engineers, designers and architects. It should be approached by them in much the same frame of mind as they would approach any new material having characteristics and properties different from materials which they have worked with in the past. The list of items that can now be made of plastics, but which were impractical before, is great. No attempt will be made to cover them all in this article.

The automobile industry may find the material suitable for increasingly larger and more important sub-assemblies. Laminated gears may be molded with the teeth included instead of forming a blank and subsequently machining the teeth. In the housing field, decorative panels with uneven surfaces, plastic doors, plastic baseboards, window frames for interior or external use and plastic flooring are other suggested possibilities. In the transportation scope it should lend itself to much of the panel work, including instrument panels, inside of busses, railroad cars, airplanes, ships, and many articles such as lavatories, sinks, toilet seats, luggage, table tops, large machine housings, building doors and moldings, seats, backs and arms of chairs. From what has been said a little thought will show that the field is practically unlimited.

Credits: Material: Resin-X-Crepe, manufactured by The Paper Service Company

Complete plastic dentures

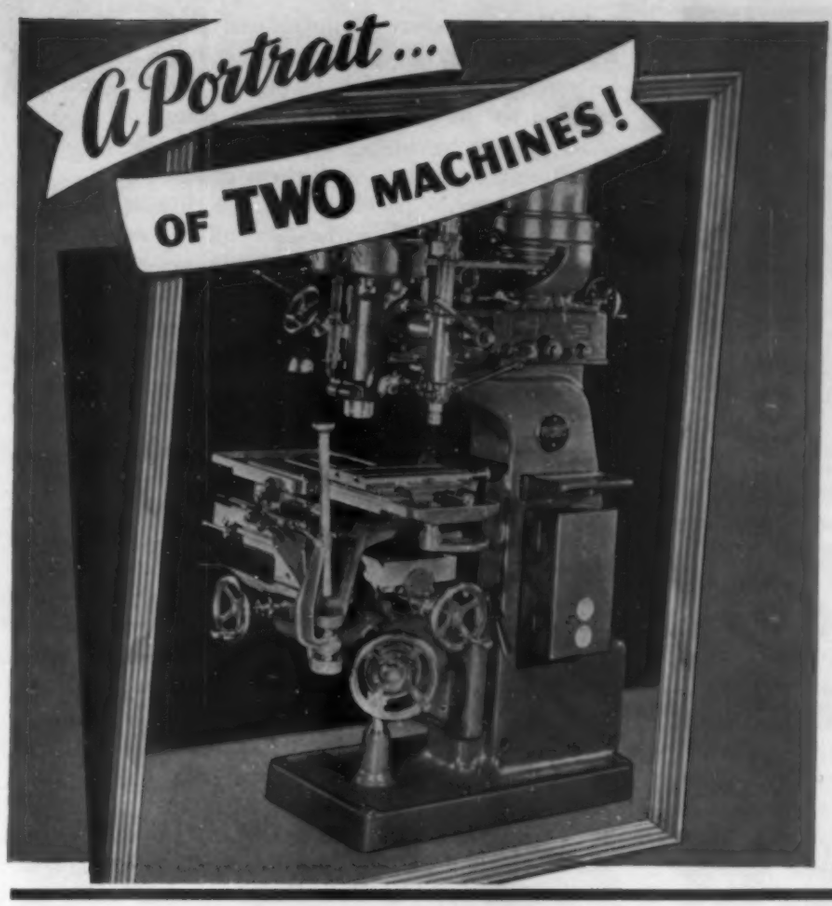
(***Continued from page 46***) teeth were made from acrylic resin using a finely ground powdered polymer with a liquid monomer which, when mixed together, formed a soft putty-like mix. By making two or three separate batches and using different colored tooth tinted powders, it was possible to obtain a blended natural tooth effect. Many improvements followed these early experiments and recently immediate denture restoration was accomplished, whereby the artificial teeth were reproduced in the almost exact shade, color, and position as they appeared in the mouth. The results of these experiments and the many favorable reports received from the men who have carefully observed the wearing qualities of these "tailor-made" plastic teeth soon aroused an active interest on the part of a prominent tooth manufacturer,* who displayed at the American Dental Association Meeting at Cleveland in September, plastic teeth in many molds and shades. Since that time other tooth manufacturers have entered the field.

Method of making dentures

The procedure for immediate denture restoration by which it is possible to have the natural teeth extracted and replaced by artificial ones in less than one hour after extracting with practically no pain, bleeding or interruption in the patient's normal pursuits, may be described as follows:

A color guide is employed to determine the shade of the patient's teeth; if the natural teeth which are to be removed have cavities in them, they are drilled

* H. D. Justi & Son, Inc., Philadelphia, Pa.



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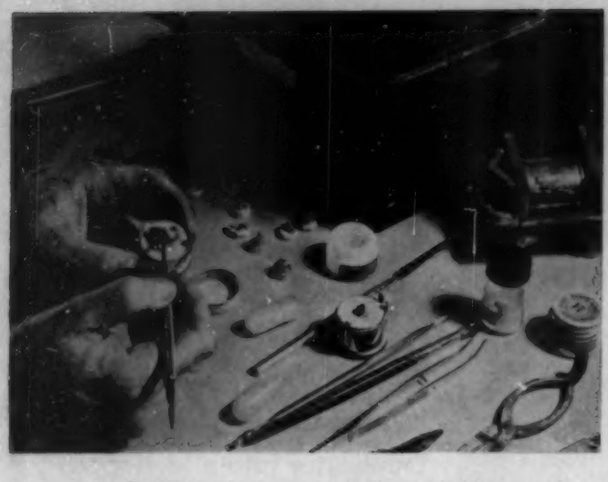

9—Individual teeth, jackets, bridges and inlays are made of acrylic resin in approximately the same manner as described in this article

sufficiently to be filled with temporary cement. This is done simply to restore the shape of the natural teeth and to remove any undercuts which might distort the impression which is subsequently taken of the mouth and teeth.

Impressions are taken using a hydro-colloidal material which must be done with considerable care (Fig. 1). Every detail of the teeth and gums are then recorded in the stone cast which is made from the impression. By a series of steps the missing teeth are filled in on the cast by adding more of the stone mixture and then carving to form a full complement of teeth (Fig. 2). This form becomes the master model and is boiled in stearic acid, placed in an iron ring, and covered with hot molding material which is chiefly composed of rubber, to form an elastic mold (Fig. 3). Duplications are now made, but this time the teeth part are poured up in soluble stone while the base is added with a mixture of regular stone. This new cast now presents teeth which may be easily broken down, while the base remains solid and firm.

In those cases where natural teeth are separated, as in these illustrations, or irregular, it is advisable to make changes for esthetics. A simple method for making these corrections is to cut away the stone teeth one at a time and replace in the desired position manufactured tooth stock forms (Fig. 4). After the tooth spaces are filled and the case waxed, tin foil is used and smoothly adapted over all of the teeth and the wax portion, and invested in a bi-sectional iron flask (Fig. 5). The flasking is completed by placing the upper half of the flask in position and covering the case with plaster of paris. Separation of the flask is done by boiling which causes the wax and soluble teeth to become broken down. On separating the flask the technician has an excellent mold of the patient's teeth and the gum relationship. Where soluble stone teeth have been boiled out as illustrated, it is very important that the tooth foiled molds in the flask be thoroughly cleaned.

In the case where manufactured plastic teeth are used, separation of the flask is done with hot water instead of boiling which leaves the tooth forms in position so that the case may be completed in the usual manner by adding a pink base acrylic material which unites perfectly with these plastic teeth.

Now comes the packing of the plastic material into these matrices to form the teeth of the case. Two mixes of tooth-colored polymer with a monomer are prepared in order to blend the shades which are to represent the natural tooth coloring. First, the lighter shade is used to form the tips of the teeth, then the darker color is added, packing the material in position in the tooth molds. Some technicians coat the tooth molds with vaseline before packing. By this method it is possible to remove the form and cut away the excess material thus aiding in shaping of the teeth (Fig. 6).

The adding of pink base material resin to the case is done in the same manner as done in making any regular denture, the pink, of course, forming the gum section (Fig. 7). The flask is then placed in warm water or glycerin and by slow gradual increase of heat and pressure, the case is processed in about one hour. After the flask is removed from the bath and cooled, it is opened and the denture removed from the plaster investment; polishing and finishing is then done to complete the case (Fig. 8).

The final step in this immediate denture service is the removal of the natural teeth. As a rule it is best to have the upper or lower teeth extracted one set at a time which permits the patient to become more accustomed to the use of the appliance.

On the removal of the teeth a *try-in* is first made to determine any impingement or "high spots" which press against the gums. These are removed so that the denture sets comfortably in the mouth. The average individual would be very much concerned about having a denture forced over "sore" and bleeding gums, but they should reason that a surgeon would never leave a cut involving bone exposure open without some kind of surgical dressing. That is exactly what is done in these immediate cases for a surgical zinc oxide paste is used as a temporary lining in the denture for the purpose of alleviating pain, and to stop the bleeding. This paste gradually hardens and acts as a temporary lining during the days or weeks of healing and shrinking of the gums. Later when the tissue becomes hardened, a permanent reline is made of acrylic resin.

Some of the claims made for these new all-plastic dentures are that the teeth are practically unbreakable, shatterproof and the weight of the appliance is only half of that of the porcelain tooth dentures. There is no "clattering" and better enunciation and more tongue space for the patient. It is said that the wearer enjoys more comfort and satisfaction than with any other form of partial or full denture yet produced.

The use of plastics in dentistry as referred to in the beginning is not limited to dentures, and hundreds of jacket crowns, bridges, inlays and fillings (Fig. 9) have

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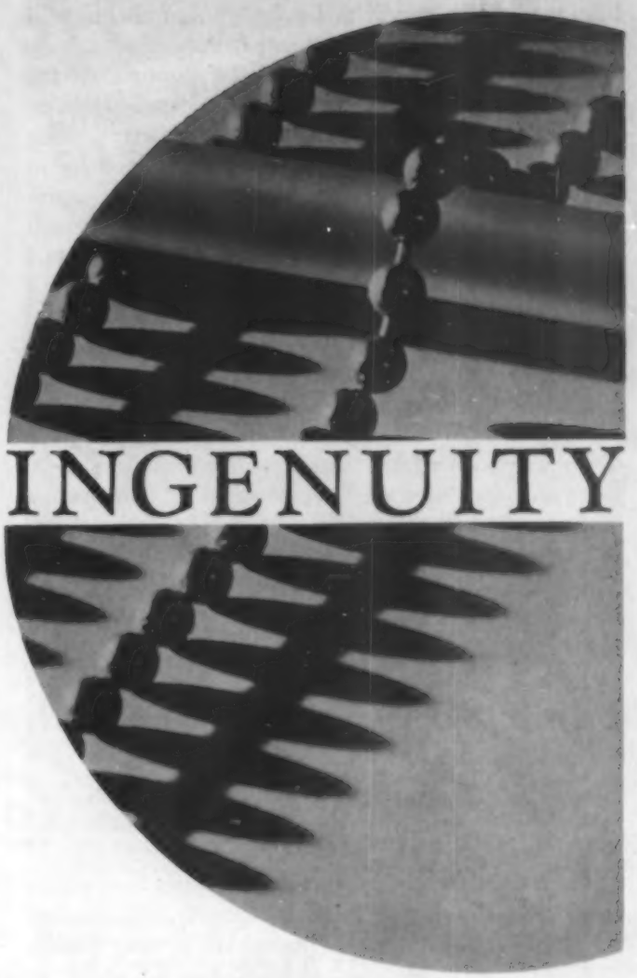

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been made from acrylic and polystyrene resins as well as other plastics, with many satisfactory results.

Dental schools, and universities throughout the United States are now busy with research work on various plastics. Some are considering establishing departments for instruction in the use of plastics in dentistry. During the last year the dental societies throughout the country have evidenced, through lectures, bulletins and various published reports,† interest in the subject of organic plastics.

Extensive clinical experience is now being obtained in the use of denture plate bases and teeth made of acrylic plastics. The findings have been generally favorable. The experience which is being obtained through actual use, is being recorded for popular dissemination to the profession. While plastics have for years served dentists, prospects of their better performance and wider use, as a result of these new developments, are even more promising.

† Modern Plastics, November 1940, p. 51. Modern Plastics, February 1940 p. 46.

Films and plastics from starch

(*Continued from page 65*) starch and phenol. The material may be used alone or after mixing with plasticizers and fillers.

The research on the production of plastics from starch is still in a developing state, but results indicate that eventually plastics made from starch may find a greater market.

According to the *News Bulletin* of the National Farm Chemurgic Council,[24] potatoes comprise the largest vegetable crop in the United States. During the ten-year period 1928–37, the average yearly production was about 372.3 million bushels. In 1938 and 1939, the total crop was around 374.2 million and 361.0 million bushels, respectively.

Commercial potato production is concentrated in a few well-known areas: Aroostook County, Maine; Long Island, New York; Eastern Shore of Virginia; Red River Valley of Minnesota; and southern Idaho. There are also important growing areas in Michigan, Wisconsin, Colorado, Pennsylvania, and the Carolinas. In recent years, the growing of early potatoes has become increasingly important in the South.

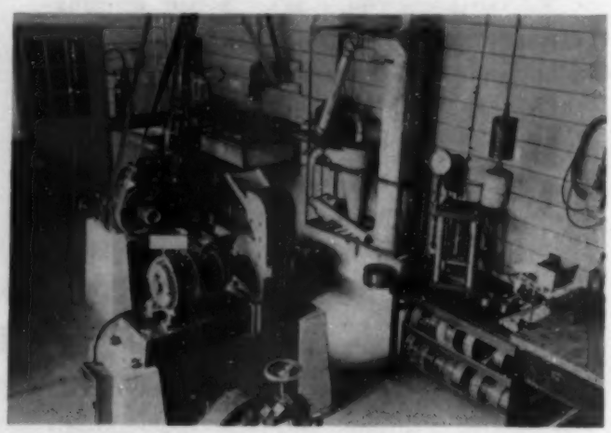
At present, culls, which average as high as 37 million bushels a year, are used mainly as feed on the farms where produced. There is a potato starch industry in Maine, utilizing usually around 50,000 tons of potatoes per year. The production of white potato starch in this country in 1935 was about 33.8 million pounds, which was the highest on record. In 1937 the production was around 9.4 million pounds, which was slightly larger than the production in 1933. A large portion of the potato starch is used by the textile industry in the sizing and finishing of cotton textiles. It is also used in the manufacture of dextrin, soluble starch, malt sugar, beer, confectionery, and nitro-starch explosives.

New methods and equipment are being developed in the potato starch industry looking toward increased output of a higher quality product. Utilization of potatoes for the manufacture of industrial and fuel alcohol, an extensive development in several European countries, has not proved, so far, to be economically feasible in the United States.

[24] Vol. II, No. 1, January 10, 1941.

New mica-resin compound developed by TVA

(*Continued from page 63*) are compared with the mica-resin material. All the tests were made according to A.S.T.M. specifications unless otherwise indicated. The test specimens for the electrical tests were four inches in diameter and one-eighth inch thick.



A view of the experimental laboratory of the Minerals Research Division of the Tennessee Valley Authority at Norris, Tennessee, where the investigations on combining schist mica and phenolic compositions were conducted

Conclusions

The conclusions which have been reached to date in this study may be listed as follows:

1. The addition of mica to a phenolic molding composition involves no apparent difficulties in manufacturing a molded article.
2. Mica recovered from schist ores appears to have inherently better electrical properties than ground scrap micas.
3. The mica added to a molding composition must be finely ground for the best flow in the molds and the best electrical properties.
4. Mica added to phenolic molding compositions increases their electrical resistance, especially in regard to dielectric strength.
5. The additions of high percentages of mica to phenolic resins do not reduce the power losses as much as might be expected.

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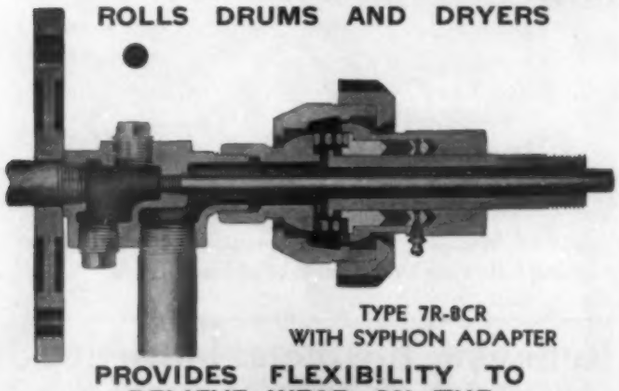

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Plastics defense conference

(*Continued from page 47*) of combat equipment. The severity of such sudden stresses requires that equipment be of the most rugged construction throughout, a requirement which applies particularly to plastic parts. These stresses may reach perfectly enormous values at times."

Mr. C. P. Winslow of the U. S. Forest Products Laboratory informed the meeting of the work they are doing on alpha cellulose. He brought out in his brief discussion the high qualities they are obtaining in these types of wood products. He stated the laboratory would like to participate in any practical way with the plastics industry in developing these materials to meet the industry's requirements.

Frank Shaw of Shaw Insulator Co. outlined instances where plastics have been replacing wood. He exhibited a gunstock which was in production at present as an example. He reviewed several other cases where the same transition might occur. He reviewed the possible weight-saving economies of plastic airplane carbureter housing over the present ones of metal. He outlined other plastic advantages.

Dr. Gordon M. Kline of the U. S. Bureau of Standards reported on the British wartime plastics program.† He mentioned several new military applications, and he also emphasized the reported accelerated progress the industry was experiencing there due to the impetus of war demands. The printed reports that were reaching the American Plastics Industry from England on contemporaneous developments there were generally vague, he observed. Dr. Kline pointed out that England's military applications in plastics are said to number well over 1000, that developments in non-military applications are being undertaken to conserve supplies of metals needed for military applications, and that a control of plastics production by a governmental controller had been promulgated to foster cooperation between government agencies and plastics manufacturers in promoting the use of plastics for military applications.

Upon reconvening for the concluding afternoon session, George Sicard reported upon a request the conference had received from the Office of Production Management who had had an observer at the morning meeting. O. P. M. he stated had sent a representative because of its interest in the industry. He stated further that O. P. M. was impressed with the undertaking and believed it could derive much helpful production information if an effective working group were created.

Joe Adams of International Molded Plastics, Inc., commented upon the desirability of having an effective workable program. "Whatever was undertaken along the line should be practical," he cautioned.

Colonel K. F. Adamson of the Ordnance Department, U. S. Army, cautioned upon the misapplication of any materials. He graciously warned the plastics industry and those who are interested in it to keep continuously in mind the extreme variations in field conditions that war materials had to withstand. When specifications called for parts to withstand −50 deg. F. to +170 deg. F., they were not based upon hypothetical laboratory standards. He cited that in Alaska low temperatures in the range of −50 deg. F. were frequently encountered. Today the British African forces were actually fighting where temperatures of 120 deg. F. existed. Another example of extreme high temperatures which he mentioned occurs in the holds of ships in the tropics when ammunition is being transported. Colonel Adamson stated he was still enthusiatic about the superiority of metal for shells. Where plastics were being considered for military applications he advised proceeding cautiously. Without question there were places where they should be and are being advantageously applied, he acknowledged.

Asked, if, in their opinion, they felt, through a cooperative industry program on plastics, beneficial assistance, technical and otherwise, could be rendered to the various government branches, several government representatives affirmed that such an undertaking properly handled could be extremely helpful. Therefore, Spencer Palmer, of Tennessee Eastman Corp., introduced the following resolution which was unanimously adopted.

RESOLVED: That this meeting of the Plastics Industry request the Board of Directors of the Society of the Plastics Industry to appoint a committee, not necessarily from within the Society's membership, to cooperate with the production and technical groups of the United States Government.

That the directors of SPI contact in advance of appointing the Committee the government agencies with whom the committee would work to determine the size and the representation on the committee which the government departments concerned would consider most workable.

The government departments and agencies to be considered are:

1. Department of Agriculture
2. Department of Commerce
3. U. S. Navy
4. U. S. Army
5. Maritime Commission
6. Office of Production Management

The Chairman of the conference, William T. Cruse, Editor of MODERN PLASTICS magazine, adjourned the meeting following a discussion of general topics.

Relieving the metal bottleneck

(*Continued from page 35*) making compelling demands on the available supply of such metals, it appears that the supply available for other production in the non-defense sphere will be diminished.

"This means, in turn, that the whole question of plastics now becomes more important than ever before. A number of industries through their trade associations have already launched investigations to see how and

† See Plastics Digest, page 68.

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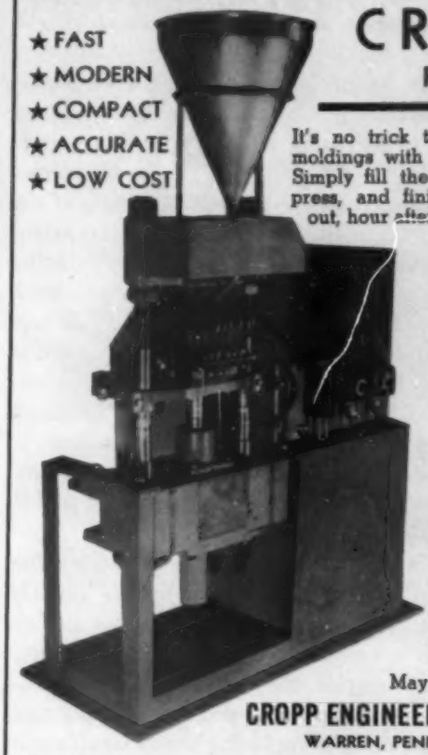

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to what extent they can expand the use of plastics in their products. We feel that manufacturers who have not yet done so should make similar efforts.

"Industrialists in the United States have been giving increasing attention to plastics as well as to the use of other substitutes for a number of years. But the process of 'designing into plastics' has been greatly accelerated in recent months by the development of the defense program. This is the case not only in the field of ordinary commercial production, but also in the production of military aircraft."

Plastics have participated in a major way in this program. Their development has been both vertical and horizontal. The properties of the older plastics such as the phenolics and the nitrated celluloses have been both further explored and applied, and additional plastics including the ureas, styrenes, certain cellulosic types, acrylics and vinyls, while long known chemically, have been within recent years developed commercially.

Now all plastics, in addition to being applied where they perform vital essential functions in direct military applications along with steel, copper and aluminum, are being called upon to supplant metals of these and similar classes in non-defense industries. In addition to supplanting metals plastics are also finding application where there is shortage of certain woods.

The Office of Production Management has declared that non-defense industries substitute plastics. With an unprecedented demand existing for metals of limited production or of foreign source such as zinc, aluminum, chromium, nickel, magnesium metal and tin, O. P. M. in taking this action may relieve if not prevent congestion in important non-ferrous metal bottlenecks.

The production of all types of plastics relies upon raw materials of domestic origin. It is fairly well established (MODERN PLASTICS, Aug. 1940), with but one exception, that there is an adequate supply of raw materials for practically any present demand. Plastics may be substituted in different ways for various classes of metals. There are innumerable possible applications. In many instances the plastics by virtue of their qualities may even serve in a superior manner. Often it is possible to secure a more accurate reproduction in plastics, economically particularly where intricate bosses and ribs are specified.

The plastic equivalent of die casting metal is injection molding. While this method of molding plastics is at present on a production basis restricted to thermoplastic materials it is none the less extremely important. Since the process is as nearly automatic as any molding operation, requiring a low tool or die cost, it could absorb a large volume of parts which at present may be of metal die castings.

One molder reports that his company is at this time tooling for parts to replace die castings for three important vacuum cleaner manufacturers. The parts in most instances have never before been made in plastics, including such items as hose fittings, ends for cylinder type cleaners and nozzles.

Metal plating of plastics is now an established plant practice in the United States. This method would lend itself well where finishes are essential even in plastic substitutes or where a metal surface is necessary for resistance to corrosion. Possibly injected plastics could be adapted for exterior applications by employing a metal plating.

The continuous length extrusion of thermoplastic materials is an old art in the plastics industry—most extensively used in extrusion by wet processing nitrocellulose materials. For many years the profile shapes produced by this process were the raw materials of the manufacturers of fancy buttons. Recently the extrusion of dry materials has been perfected, thus reducing the time of processing and enabling processors to work with less costly forms of plastics. Several manufacturers have developed shapes for interior architectural decorative trim. Extruded plastics have been successful for decorative purposes in automobile interiors. As with extruded metal there is practically no limit to the profiles obtainable. It serves splendidly, for example, in strip form for decorating counters and tables, as well as for wallboard and linoleum.

An important application of the vinyl materials has been as lacquered coating in beer cans, and as liners in other containers. As an alternate material for surface coating where tin is now being employed they have potentialities. Vinyl coated cardboard and paper containers could replace certain tin and aluminum types. Translucent sheet stock is replacing metal templets in metal sheet fabrication.

The thermosetting plastics offer interesting possibilities for many varied shapes and sizes of housings now in metal. Their application for such purposes in the scale, clock and the adding machine fields is well known, and, their use for these purposes along with other applications could be almost indefinitely expanded.

Many companies having anticipated metal shortages have already replaced certain articles and parts with plastics. America's leading industry has been awake to the situation. While not all of the automobile manufacturers have taken steps to meet the impending shortage, several are well on the way. In some cases where they have been using plastics because of their inherent properties, their present more or less obligatory transition is less painful than it would be if plastics had not been tried at all. In fact two companies who have been aggressively studying the possibilities of the more extensive application of plastics lament the fact that they haven't proceeded more expeditiously.

As a part of the Ford Co.'s program they made a horn button from a thermoplastic material which weighed 10 ounces. The same part had weighed 43 ounces in zinc. In another case they restyled an instrument bezel. In metal it weighed 6 ounces—in plastics, 2 ounces. By studied re-designing of forthcoming models, Willys-Overland Motors, Inc., anticipate they will save five pounds of zinc on each unit. Plastics will fit into such a program ideally. The automobile industry is now using quantities of plastics in motor parts in both molded and laminated form as well as for interior décor

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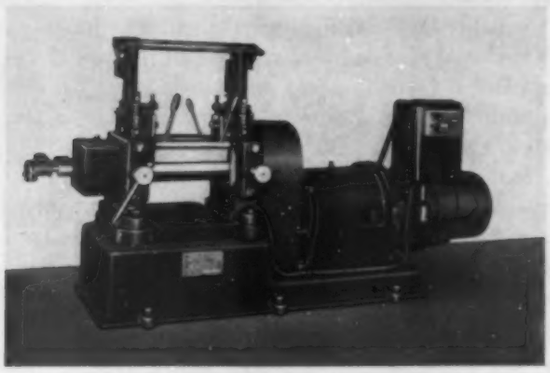

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Lightweight injection molded cellulose acetate valve guards for use on gas masks are an outstanding example of replacement of plastics for metals

and as functional parts. By restyling in these cases their application may be expanded.

Plastics have gone hand in hand with the development of airplanes, in numerous well-known applications. In transparent sheet form they have served for windows and as cockpit and nose housings. The laminated types have been made into radio masts, terminal blocks, pulleys, engine cowl flap connectors, filler blocks, instrument and switch panels, cable guides, heating and ventilating ducts, trim tabs, fairleads, electrical and anti-chafing insulation, spacers, decorative paneling, gears and interior trim. When molded, plastics have been used for terminal blocks, control knobs and handles, ventilator inlet selector valves, instrument cases, speaking tube mouth pieces, gun stowaway blocks, lighting fixtures, control wheels, pulleys, window garnishes, compass card holders and switch boxes to mention but a few applications. Recently in conjunction with wood as plastic-plywood they have been going through rigorous army and navy tests to determine their suitability for structural parts. Based on the conclusions of these tests several trainer planes have been ordered. The materials are to an increasing extent being used for airplane sub-structures.

The non-corrosive attractive weight–strength ratio and the desirable machining properties of molded phenolics have brought them into consideration as possible materials for carburetors for airplane motors. The carburetors of magnesium metal or aluminum on 2000 hp. engines weigh approximately 40–50 pounds. If the molded phenolic types prove out they will among other things reduce the weight to about fifty percent. When it is recalled that on a large 4 motor airplane there may be as many as 10 gas tanks which must all be interconnected the demand for numerous valves becomes evident. Valves constructed with molded plastic parts are working out satisfactorily experimentally.

As a forerunner of what may develop in the closure industry is the report of a Midwestern supplier. A customer who had been using an aluminum bottle cap felt the pressure of a dubious continual supply of metal. He converted his requirements entirely to molded closures. Bottle pourers and syphon heads formerly of die cast metal are now being molded. Collapsible tube caps and perfume bottle caps and cosmetic containers have followed the trend to plastics.

Probably no field offers more possibility for conserving essential metals by conversion to plastics than the electrical industry. Ideal possibilities exist for changing aluminum lamp stands, fluorescent light fixtures, radio bezels and meter housings to some plastic.

Household articles were among the first to feel the impending pinch of metal priorities. A fruit juice extractor formerly made of metal along with fans, broom handles, chime housings, picture frames and cake and fruit knives are among the most recent additions.

The General Fireproofing Co., makers of metal furniture, working on a chair contract for a new ocean liner found it quite economical to use a machined methyl methacrylate rod instead of an anodized aluminum tube for chair arms.

Current refrigerator models take full advantage of the utility and beauty of injection molded polystyrene for extensive interior parts instead of aluminum.

An outstanding application of plastics to circumvent a dearth of die castings was the development of a washing machine agitator. This was not accomplished on the spur of the moment. In fact the molder availed himself of the extensive laboratory development work the raw material maker had undertaken for some time.

Even Mierschaum pipes have been washed by the current of this semi-spontaneous quasi necessary trend. One molder reports, "About a year ago we started molding pipe bits for the Missouri Mierschaum Co. Our first part for them was a 20-cavity injection mold to produce a bit for their 10-cent corncob pipe. Then we built a 10-cavity mold for a stem for their 25-cent pipe. The mold was designed, so that we now cast the shank as part of the stem. Thus the shank is now plastic instead of a piece of metal."

Camera parts, toys, display fixtures, business machine housings, movie projector parts and spectacle cases are being executed in plastics to avoid metal shortages. A burial vault manufacturer is exploring the possibility of a plastic plywood casket.

Plastics then are performing a two-fold industrial emergency mission. On account of their own peculiar irreplaceable characteristics they are serving as strategic essential materials for many applications in the emergency. Because of their availability they are battling for other classes of raw materials such as non-ferrous metals which are not unfortunately so abundant. How far plastics will be required to substitute is problematical. It is moreover too early to measure quantities or draw final conclusions. In all likelihood, they will retain the majority of these emergency applications for they are being carefully engineered and cautiously watched as the transition progresses.

Credits: Formica laminated parts Bakelite gumstock molded by Shaw Insulator Corp. for Smith & Wesson, Inc. Lumarith gas mask parts by Thermo Plastics Div. Standard Products Co.

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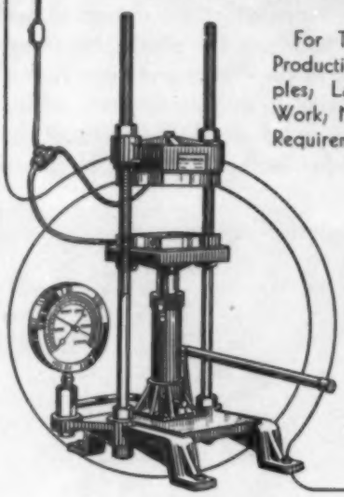

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➡ **WANTED: Injection molding presses, also dies to fit presses to be of 2½ to 4 ounce capacity in good guaranteed condition for shipment to Argentina. State full particulars and description also photos if possible. Reply Box 426, Modern Plastics.**

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Cruiser coach shade

(*Continued from page 37*) were used in the complete assembly of the shade were fabricated from the same material as that used in the shade. The design of the molds for the latch strips was such that, by using two sizes, it was possible to provide strips for all the sizes of the shade required for the various windows in the coach. The depth of slot for the latch strip is $^{7}/_{32}$ inch.

The plastic retainer strips which are cemented in the shade form a runner in which the plastic latch strips are inserted. Because of the design and engineering in this piece, it was possible to use plastic material in all of its parts. The only metal used in it is a small spiral spring and a small insert in the end of the latch strip.

The large size of the mold used to produce the bus window shades can be seen in this close-up of the extra-size hydraulic press built for just such jobs. Over half of the press itself is below the floor

A giant compression press, especially built for this job, has a 36-in. stroke, platens 50 by 60 in. and uses a 20-hp., 350-gallon gear in its operation. Although it is of 1400-ton rated capacity, the molder reports that this pressure was exceeded several times. (Above.)

Worthwhile economies in the production costs, combined with the suitability of material and intricate precision molding, share the spotlight with the spectacular size of these pieces. Their potential significance in the transportation and home decoration field can be guessed at only on the basis of such economies and design trends

Credits: Tenile II; Molded by Eclipse Moulded Products Corp. for Greyhound Corp. Press by Williams, White and Company.